

*Te Rangahau Taiao  
ki Awanuiārangi*

2017

A COLLECTION OF READINGS  
FROM GRADUATE STUDENT THESES

EDITED BY PAUL KAYES





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### **Disclaimer:**

The chapters in this book are taken from some of our PhD and Masters' students theses. The research is therefore theirs. In the case of the PhD theses, three people examined them - one examiner was from Awanuiārangi, one from a university within New Zealand and one from an overseas university. Two examiners examined the Masters theses - one from Awanuiārangi and one external to Awanuiārangi, normally a New Zealand university.

CITATIONS *(please use these when citing a chapter from this book.)*

Chapter One:

Gregor, K. (2017) Combining Education and Science Outcomes: The Marine Studies Programme and Tūhua Marine Reserve Monitoring. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 11-30). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

Chapter Two:

Paul-Burke, K. (2015). Māori Marine Management. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 34-55). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

Chapter Three:

Ellis, K.K. (2012). An Evaluation of Customary Fisheries Management in Tauranga, NZ. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 57-74). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

Chapter Four:

Mooney, W. (2015). The Rena and East Coast Communities. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 77-97). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

Chapter Five:

Warren, P. (2015). Pāua to the people: Contemporary kaitiakitanga. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp.99-121). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.



#### Chapter Six:

Takura, T. (2016). Wetlands & waterways through a weaver's lens. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 123-140). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

#### Chapter Seven:

Babbington, R. (2014). The Marae as a Foundation for Kaitiakitanga. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 143-161). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

#### Chapter Eight:

Teinakore-Curtis, F. (2015). Shaping a sustainable environment: The challenges facing iwi from water management practices on Lake Rotoiti. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 163-183). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

#### Chapter Nine:

Chase, T-R. (2017). Te ohu mō Papatūānuku: A collective response for the health of the people and the environment. In P.H. Kayes, (Ed), *Te Rangahau Taiao ki Awanuiārangi 2017* (pp. 185-201). Te Whare Wānanga o Awanuiārangi, Whakatāne, New Zealand.

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## INTRODUCTION

This book presents nine graduate students' research. Each chapter derives from the thesis of a PhD or Masters' student thesis.

Chapter One presents Keith Gregor's excellent PhD on the long running study by staff and students from Bay of Plenty Polytechnic (now Toi Ohomai Institute of Technology) in and around the Tūhua Marine Reserve. Keith's PhD combined a series of linked papers and reports on the development of the unique science/education partnership with the Department of Conservation; the results from 1000s of scuba dives to monitor the marine life in the marine reserve over the last twenty years; and the outcomes for the main student participants. It also highlighted the challenges faced in the efforts to understand the ecological processes at Tūhua and how they should best be monitored.

Chapter Two summarises Kura Paul-Burkes's PhD on Māori and Marine Management. Kura has been studying Ōhiwa harbour for a number of years with a particular focus on mussels (kūtai) in the harbour. Her studies led to questioning and researching the challenges faced by Māori and environmental managers. The space and place for Māori in marine management.

Chapter Three is a study of Customary Fisheries Management by Kia Maia Ellis in Tauranga, New Zealand. Kia Maia has long been involved in customary fisheries issues for her iwi, Ngāi Te Rangi. Her master's thesis looked at the effectiveness of a management system for recording fish taken under customary fisheries permits.

At the time Kia Maia was completing her thesis the MV Rena ran aground on Ōtāiti (Astrolabe Reef). Oil and rubbish spilled along the coast, including down to the East Coast coastal communities. Wiki Mooney's Master's dissertation (Chapter Four) studied the impacts on those communities and concerns around effective communication. He describes the significant emotional and cultural impact on the tangata whenua.

Issues raised in Kia Maia's thesis led to Chapter Five. This chapter summarises a master's thesis by Paul Warren investigated Pāua enhancement within the Te Maunga o Mauao Mātaitai Reserve. Scuba based surveys of pāua within the reserve identified a lack of juvenile pāua. This led to re-seeding trials. Paul's thesis details these and the often-bureaucratic difficulties faced by hapū / iwi seeking to improve fish stocks within Mātaitai.

Chapter Six moves us only slightly away from the sea and onto the coast. It gives a look through the eyes of Tracey Takuira at wetlands and the plants used for weaving. Tracey is a weaver who used one of her exhibitions to highlight her feelings and thoughts about the impacts of the Rena and the oil spills. Her thesis combines several threads or themes - plants, environmental and land management, kaitiakitanga, art (weaving) and mātauranga Māori. These explore the notion of nurturing and managing water ways and plant stocks to ensure the availability of plants for weaving.

Chapter Seven by Rene Babbington looks at the concept of kaitiakitanga and the survival of the marae. Rene researched the life history of her marae - Mangatū - and how kaitiakitanga is passed down the generations. She questions how people think about and apply kaitiakitanga on marae today. Rene's thesis confirms for her, the marae as the central point for the practice of kaitiakitanga.

Chapter Eight takes us to freshwater. Frances Teinakore-Curtis examines the challenges facing



her iwi around Lake Rotoiti. Rotoiti was once abundant with kai moana. Local tangata whenua managed resources carefully and understood the impacts caused by water levels changes. This has changed. Frances focuses on water management practices and the ability (or lack of) for iwi to meaningfully engage with freshwater.

The final chapter, Chapter Nine, is from Te Reinga Chase's master's thesis. Te Reinga works as health administrator for her iwi. She became interested in the long-term health effects on her people from exposure to chemicals used in the sawmill industry. Te Reinga interviewed several families to find out more about these effects and their fears for their children and grandchildren.

A comment regarding referencing. We generally recommend APA referencing to students. However, I believe that now everything is quickly found through an online search, the previous rationales for any particular referencing system are largely redundant. If we can locate the article or report being quoted - then that's referencing answered.

Nāku noa

Paul Kayes

November, 2017.

*Te Rangahau Taiao  
ki Awanuiārangi*



## CHAPTER ONE

### COMBINING EDUCATION AND SCIENCE OUTCOMES: THE MARINE STUDIES PROGRAMME AND TŪHUA MARINE RESERVE MONITORING

*Gregor, K.*



Keith Gregor  
(photo: Tessa Blackett)

#### **KEITH EWEN GREGOR**

**Work:** Senior Academic Staff Member, Toi Ohomai Institute of Technology, Tauranga, New Zealand.

**Title:** Course Co-ordinator Marine Studies Department.

**Qualifications:** PhD, PADI Dive Instructor, Commercial Skipper.

Keith has been teaching Marine Science in tertiary education for almost twenty years and has also been involved in marine monitoring at the Tūhua Marine Reserve for about the same amount of time. A major part of his tertiary teaching practice and thinking revolves around methods of engaging and enthusing students through active involvement in field activities linked to research outcomes. To this end he continues to strongly promote the concept of hands-on learning and personal development through field activities where students are fully immersed in the environment.



## Abstract

The focal point of this chapter is Tūhua (Mayor Island), an offshore island positioned on the edge of the continental shelf in the Bay of Plenty, New Zealand. In 1993 a no-take marine reserve was gazetted around the exposed northern end of island, and this has been the subject of annual marine monitoring surveys since that time. Continuance of this regular monitoring has only been possible because of the creation of an innovative science/education partnership between the Tūhua Trust Board, representing the traditional owners of the island, the Department of Conservation (DOC), responsible for managing the reserve, and the Marine Studies Department of Bay of Plenty Polytechnic (BOPP, now named Toi Ohomai Institute of Technology).

In this long running partnership, the Marine Studies team conduct the marine surveys while the other partners provide logistical support and feedback on direction and overall approach of the research programme. It was expected that creation of the marine reserve would lead to growth in fish numbers in comparison to the adjacent less protected areas, however this expectation was confounded and little change in key indicator species was apparent even after ten years of protection. This precipitated a review of the monitoring methodology and marine management policies to address this lack of response. The student surveyors have been a vital part of this partnership approach to the monitoring, so in addition to the scientific study, student perceptions of their involvement in marine monitoring extended field trip experiences were investigated using questionnaires.

The perceptions of key staff members in the partnership (including managers) were also examined through a series of monologues, and the feedback from students and staff members provided evidence of very positive outcomes from the collaborative approach. This chapter is drawn from a thesis that combined a series of linked papers and reports on the development of the unique science/education partnership, the monitoring results over the last twenty years and the outcomes for the main participants. It also highlighted the challenges faced in the efforts to understand the ecological processes at Tūhua and how they should best be monitored. The key findings of the thesis and future direction of the partnership have been outlined in this chapter and remain accurate although an institutional name and the roles of some individuals have since changed.

## Introduction

Tūhua (Mayor Island) is approximately 1,277 hectares, and situated around 26 kilometres off shore in the Bay of Plenty, North Island, New Zealand (Fig 1). The closest city to the island is Tauranga, where Bay of Plenty Polytechnic and the local office of the Department of Conservation (DOC) are both based. Tūhua is the ancestral home of Te Whānau a-Tauwhao ki Tūhua. The island is privately owned and is administered by the Tūhua Trust Board on behalf of its beneficiaries. There are several landing areas but Opo (South East) Bay is the officially sanctioned landing site, which has the quarantine station.

## TE RANGAHAU TAIAO KI AWANUIĀRANGI



*Tūhua from the air. The marine reserve is in the bottom right corner of the photo.  
(Photo: Tessa Blackett)*

The Tauranga area was first settled by Māori who trace their descent from three waka (canoes), which arrived in the Bay of Plenty around 1290 ([www.teara.govt.nz](http://www.teara.govt.nz)).

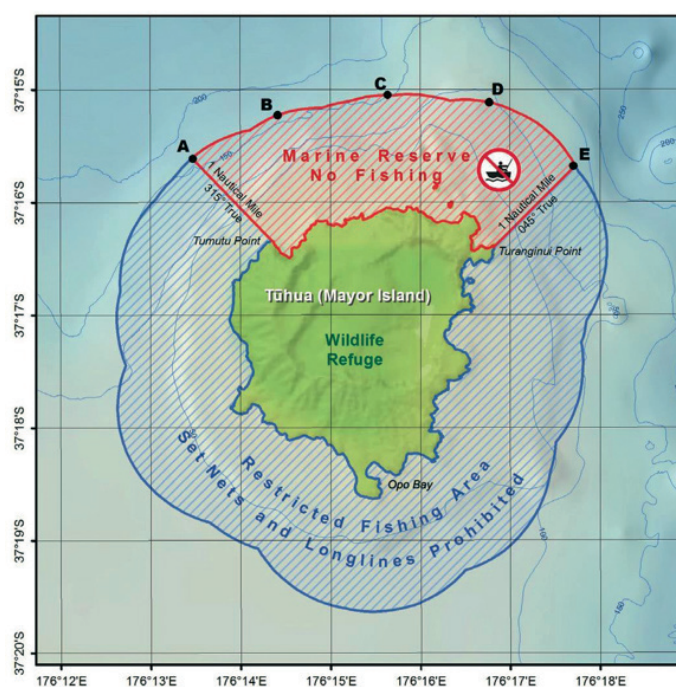
Captain Cook then arrived in the area in 1769 and a mission station was established in Tauranga in the 1830's. The first port was established in 1953 in Mount Maunganui near Mauao, the landmark mountain at the entrance to Tauranga Harbour. The port has continued to grow and today is the largest export port in New Zealand.

Tertiary education institutions present in Tauranga include Bay of Plenty Polytechnic and the University of Waikato. In 2008 the Polytechnic and the University formalised their growing partnership. In 2010, Te Whare Wānanga o Awanuiārangī, based in Whakatāne (approximately 90km to the east), joined this tertiary education partnership to deliver education to the wider Bay of Plenty region. Bay of Plenty Polytechnic is the largest tertiary education provider in the Western Bay of Plenty area. The Polytechnic was established as a local community college in 1982 and since then has moved from the traditional trades training to include certificate, diploma and degree courses.

The Marine Studies course was established in 1991 in Whitianga but moved to the Windermere campus in Tauranga in 1993 as student numbers expanded. It has grown from a one-year certificate course to a two-year diploma with the option to add another year to achieve a Bachelor of Science degree. This degree is currently conferred by the University of Waikato. The first year of the course is mainly introductory with the key subjects focused around biology, marine ecology, fisheries management and conservation.

The second year of study is not so prescriptive and students get to choose several optional courses along with key compulsory courses. A major point of difference from traditional undergraduate study is the emphasis on practical skills and experience, including intensive, extended field trips in both years one and two. These can last for up to two weeks and involve students being immersed in the outdoor environment. The locations are the Mercury Islands off Whitianga, and Slipper Island and Tūhua in the Bay of Plenty and Lissenung Island in Papua New Guinea.

Tūhua has had the conservation status of a wildlife refuge since 1953. It has healthy populations of native birds and has also been the subject of re-introductions of several iconic New Zealand endangered species from the mainland. Marine protection around Tūhua is unique in that there is a total no-take marine reserve adjacent to the northern section of the island and the waters around the rest of the island are designated a partially protected management zone, also referred to as the restricted fishing area (see chart below). The no-take marine reserve around the northern end of the island and the restricted fishing area compliment the terrestrial conservation efforts at Tūhua, which is now free of mammalian pests.



Map of Tūhua (Mayor Island), showing the Marine Reserve and Restricted Fishing Area.  
(Source: [www.doc.govt.nz](http://www.doc.govt.nz))

For over twenty years a unique science/education partnership has operated around Tūhua, comprised of the Marine Studies Department of Bay of Plenty Polytechnic and the Tauranga Area Office of the Department of Conservation (DOC). With the support of the Tūhua Trust Board, representing the tāngata whenua (indigenous owners of the island), the partnership has been undertaking annual marine monitoring around Tūhua to document changes in a range of species likely to be affected by extractive fishing practices. Regular sampling of marine species around offshore islands involves a myriad of logistical and human resource complexities, particularly if the sampling areas are large, diverse and exposed to the vagaries of the weather, as is the case at Tūhua.

These factors, along with the offshore position of the island on the edge of the continental shelf, have complicated the story of recovery and challenged our understanding of the processes involved in ecosystem rebound after protection.

These problems were partially solved at Tūhua by the formation of the unique science/education partnership, which has become an exemplar of collaboration in this part of the country. DOC



supplied logistical support, while Marine Studies staff and students provided the survey muscle. Carefully trained successive cohorts of second year Marine Studies student surveyors, under close staff supervision, were involved in running most aspects of the annual Tūhua survey including data collection and entry. The extent of the annual survey changed from the original group of eight student surveyors with single vessel support in 1993, to twenty years later a minimum of twenty-five surveyors, three vessels in support and complementary staff numbers.

Along the way important questions have been raised about the effectiveness of the sampling tools utilised to enable or facilitate the regular monitoring. Sampling initially involved only annual Underwater Visual Census (UVC), where divers identify, count and estimate size of fish along predetermined transects. In response to the questions about this methodology and the results of ongoing monitoring, survey protocols were continually refined and streamlined over time. The annual diving survey is now complimented periodically by baited underwater video (BUV) surveys, which record abundance of predatory fish and don't involve divers.

## Methodology

The overall purpose of the research was to explore the successful partnership between science (DOC) and education (BOP Polytechnic) in monitoring the Tūhua Marine Reserve.

To illustrate the 20-year journey four key research components were explored and documented including:

1. Key partnership staff members' perceptions of the collaboration and outcomes (using monologues)
2. Student perspectives on their experiential learning during Marine Studies extended field trips (using questionnaires)
3. Tūhua Marine Reserve monitoring - the science and the results
4. The way forward - 10-year plan

The research combines science and education outcomes. As well as the science of the marine reserve monitoring, it presents unique perspectives from key partnership staff members and students associated with the project, meaning some aspects of the research are embedded in the field of educational psychology. The student marine surveyors play a very integral part in the monitoring at Tūhua and it can be challenging work. To gain a more complete understanding of the value of this collaboration it was important to determine what motivated them and what they gained from contributing to the collaborative work.

## Part 1. Tūhua Monologues: Key Partnership Staff Members' Perspectives

The Tūhua monologues provided the opportunity for staff members from both the Department of Conservation and the Marine Studies Department, who have been associated with the collaborative programme for many years, to share their thoughts and recollections, and to project these into the future. Typically, the participants were involved in supervision of the scientific rigour or managing the implementation of the annual surveys. The monologues capture thoughts from a variety of levels of management of the programme and provide unique insight from several different perspectives.

Monologues were explained to each participant as a collection of ideas, often loosely assembled around one or more themes with the overall purpose of collecting several individual perspectives

on the Tūhua experience, centred on the Tūhua Marine Reserve survey, which has been running since 1993.

Seven participants provided personal, individual perspectives as well their professional viewpoint.

Participants included:

- Paul Kayes - founder of the Marine Studies programme at BOP Polytechnic, 1991. In 1997, he became the first Head of School of Applied Sciences, a position he held until he left the Polytechnic in late 2006.
- Andrew Baucke - Acting Director Conservation Partnerships - Central North Island for the Department of Conservation. He then became Partnership Manager - Western Bay of Plenty, DOC.
- Chris Clark - Programme Manager (Biodiversity) at the Department of Conservation, Tauranga.
- Daniel Rapson - Ranger Services (Biodiversity) at the Department of Conservation, Tauranga.
- Dean Tully - Group Leader - Marine Studies and Environmental Management at Bay of Plenty Polytechnic.
- Kim Young - Freshwater and Marine Scientist with the Department of Conservation and involved with the annual marine monitoring at Tūhua for ten years.
- Keith Gregor (the author) - Course coordinator for the second year of the Marine Studies programme, Bay of Plenty Polytechnic; has directed student involvement in research at Tūhua since 1994.



*DOC and Polytechnic staff members and students on a Tūhua field trip  
(photo: Marine Studies collection)*

The series of monologues really captured the positive outcomes of a collegial and collaborative approach to science and education. The science/education model was unique when it was created and that uniqueness continues today, demonstrating longevity, integrity and momentum.

Chris Clark (DOC, manager): *The relationship with Bay of Plenty Polytechnic and the information gained from it is vital to the management of the reserve. It enables us to monitor the outcomes of management practices such as compliance, signs and pins marking transects, and DOC has also been partially involved in the analysis of the data (with Kim Young). DOC's new strategic direction is about communities and partnerships and this partnership that has been operating for over 10 years epitomises where DOC wants to be with conservation – working with communities, not trying to do everything itself.*

DOC is now working towards a similar model in other areas of its business, so in that regard it was very innovative in 1993.

Andrew Baucke (DOC, manager): *This is one of the longer standing formal partnerships the Department of Conservation has had locally. The partnership was unique at the time, but there have been other similar arrangements set up since. This has worked extremely well, with good value exchange.*

The outcomes of the partnership are widespread and beneficial to the local community and have extended to inform the direction of marine monitoring at regional and national levels.

Paul Kayes (ex-BOP Polytechnic, manager): *This now represents some 20 years of field work, 19 years of which has been led by Keith. The data gathered has been important to DOC in monitoring and managing marine reserves. This makes it more real to students – it means their field work learning experiences are valued as science by DOC.*

Marine reserves were created for the purpose of science and education, and the partnership mirrors this directive in a marine reserve setting. It was acknowledged that maintenance of this level and intensity of monitoring would not have been possible without the input of the trained student divers from the Marine Studies course.

Kim Young (DOC, scientist): *I have been privileged to work with Marine Studies Polytechnic staff to evaluate the effectiveness of the monitoring programme and make improvements where necessary. This included evaluating the sampling methods, trialling new methods, reporting results and making recommendations to management about both the management of the reserve and improvements to the monitoring program. To my knowledge it is the only example of an operational and science marriage between a tertiary education institute and a marine reserve management authority to meet marine reserve management and monitoring requirements.*

Another positive was that staff members from both organisations had the opportunity to witness what was happening in the marine environment around Tūhua and were better able to communicate this during their jobs. Also, students and staff members came away inspired, up-skilled and enthusiastic about the environment. On the field trips students and staff members are together day and night for ten days, working towards a common and achievable goal. The background is a tough and exacting environment away from regular comforts and interactions. They get to know a lot about each other and this facilitates community building, communication and learning. The importance of the continuity, longevity and passion of the staff members involved is apparent in the monologues and these are key elements of any successful enterprise. Staff members have remained convinced for a long time of the value of the field trips.

Dean Tully (BOP Polytechnic, manager/tutor): *The field trips and marine surveying are why we're teaching for a lot of staff, its teaching in the field about things that we love. We can inspire the students because of that. If it was all classrooms and paperwork then we may not be here. The trips are tiring, but fun and they're highlights for us.*

Clearly staff members are passionate about the impact of the learning that takes place in the environment. The trips are mentally and physically challenging but they believe the attendant rewards are worth the effort.

Dean Tully (BOP Polytechnic, manager/tutor): *DOC couldn't do this surveying themselves, due to the large number of surveyors required annually over a short survey period and it's a unique situation having many students available to do such a large amount of data collection en-masse over years. But also, the Polytechnic would struggle to do the extended field trips without DOC providing support in the form of an extra boat, fuel, accommodation and staff. And the student interaction with DOC staff is great - the students benefit from the work involved and they feel valued.*

The students annually witness Polytechnic and DOC staff actively working together for a common conservation goal. They live for ten days in a unique and pristine environment that is the product of a long-term, expensive terrestrial conservation effort from DOC and the value of this is obvious around them. They see that their monitoring efforts are going to be useful and relevant so subsequently feel valued. Staff members believe these experiences have a profound effect on them.

This field trip is talked about with family and friends on return home and this increases connectedness and awareness in the local community. Many students and staff members buy photographic equipment in order to easily capture powerful images underwater and on land. These are readily transmitted through social networks. This again increases community awareness and empathy for Tūhua and its environs.

Daniel Rapson (DOC, ranger): *Being away for ten days 'roughing it' is challenging for the students. It's a combination of the personal factors, the environment, being away for ten days, diving every day, doing monitoring. They come away thinking Tūhua is a special place and hopefully they see for themselves the benefit of the marine reserve.*

Students recalled their time at Tūhua for the Marine Studies Advisory Committee, which included representatives from local government and industry. They talked about seeing more fish while surveying but didn't feel that the methods were capturing what they were seeing. The long-term data sets revealed little or no recovery in fish numbers after ten years. A combination of empirical and anecdotal evidence drove the decisions to change monitoring practice and increase active compliance enforcement. These improvements can be directly attributed to effective communication and the range of expertise and skills involved in the partnership.

Keith Gregor (BOP Polytechnic, tutor & field trip leader): *The dynamics of the marine ecosystem around Tūhua are complex and have provided many challenges, but collectively we have pushed the boundaries of understanding and made significant gains in this direction. We, as partners, have also worked collegially in an environment of mutual trust which has added to the longevity and success of the partnership.*

Staff members recognise that students are immersed in the marine environment and also see the conservation gains in the terrestrial environment, on an island with deep cultural significance. This clearly gets students thinking and reflecting. In addition, they live and work for ten days with



DOC staff members and visiting scientists, which means they get to know each other, discuss opportunities and gain an insight into each other's work habits and attitudes. Some of the field trip staff members have graduated from the Marine Studies programme, and the students can see them at work in their vocation, as well as hearing from them about their career pathways and experiences. These forms of contact are invaluable to fledgling marine scientists who should continually demonstrate real world experience in order to secure jobs and opportunities.

Paul Kayes (ex-BOP Polytechnic, manager): *I believe the outcomes for students are numerous – obviously they finish with strong field capabilities working in remote locations; but they also develop also a deep inner confidence and competence. Their abilities to cope with very real challenges and some stress are tested and enhanced, in a well-managed, if remote, learning environment. The Marine Studies programme, through its long running field work activities, continues to provide the benchmark within New Zealand for marine environmental education.*

Andrew Baucke (DOC, manager): *Students are given access to an outdoor classroom and DOC get the monitoring data with shared responsibility for analysing and interpreting the information between the department and the Polytechnic. There is also the added value between experienced DOC staff and the students working closely together through the sharing of stories and wider DOC experiences.*

Daniel Rapson (DOC, ranger): *I think this partnership is unique. There are other partnerships with educational institutions, but not with this level of involvement and continuing for so long.*

Chris Clark (DOC, manager): *The Polytechnic and DOC worked together to come up with very robust findings from that. In the marine studies course the students focus on marine areas (intertidal down to the deep ocean) and the Tūhua situation enables them to put that into the wider context of conservation, combining the marine reserve with terrestrial aspects of conservation on a pest free island with sensitive cultural elements. So together it enables broadening out of that experience. It's the trump card in Bay of Plenty Polytechnic's qualification; at the end of the course the students are very capable and have proven field competencies.*

The monologues from a representative range of partnership staff members highlighted the variety of positive outcomes from the Tūhua Marine Reserve monitoring partnership. The science was made possible by this collaboration, and the education benefits were numerous. As well as inspiring the student surveyors and providing real world experience for them, the Tūhua field trip has been an important element in making Bay of Plenty Polytechnic's Marine Studies programme a unique educational opportunity.

## Part 2. Student perspectives on their experiential learning

This section outlines student perceptions of the experiential learning that takes place on the year one and year two Bay of Plenty Polytechnic Marine Studies extended field trips, which include the annual Tūhua Marine Reserve monitoring trip. This part of the research employed a qualitative interpretivist approach (D'Amato and Kransy, 2011) and used a mix of both quantitative and qualitative data capture to explore the outcomes of this local adventure-based experiential learning model. Questionnaires were developed to explore student perceptions of the Marine Studies extended field trips. Students in year two of their study in 2012 and 2013 were each asked approximately thirty questions on a range of aspects relating to the extended field trips in which they had taken part. The Likert scale was utilised alongside open-ended

questions. Students completed the questionnaires individually in a classroom situation. A total of 83 respondents were sampled which equated to 80% of the total possible respondents across the two-year groups.

A content analysis was carried out on qualitative responses (Patton, 2002). Similar words from the transcripts were grouped into codes and from this, representative themes emerged (D'Amato and Krasny, 2011). For both qualitative and quantitative results, descriptive statistics were used to summarise the data and to capture the key points.

The Marine Studies programme is underpinned by an environmental and experiential education pedagogy that emphasises direct, active learning experiences where learners are engaged intellectually, physically and socially. When linked to successful, extensive field trips embedded in the natural world, the results on student learning and motivation to learn can be startling (Falk and Balling, 1982; Nesbit and Mayer, 2010). The Marine Studies extended field trips discussed here can last for up to two weeks, involve a degree of isolation from family and disruption to familiar routines, challenge the students in many ways and are subject to the vagaries of weather. Experiences like these take science education out of the classroom and combine the essential attributes of outdoor, adventure and environmental education (Boyes, 2000; Neill, 2008).

Cognitive stimulation and emotional excitement coupled with a process of self-discovery can take place in academically challenging situations (Yair, 2008, 2009) and contribute to creation of personal turning points or transformations. The Marine Studies extended field trips involve a range of academic and practical challenges, such as species identification, data collection and management, as well as scuba diving, which requires a high level of trust in a diving partner. So, there is the potential for both significant personal development and relationship building. This type of situation serves to consolidate and further strengthen the bonds in these developing communities of practice (Rickinson, Dillon, Teamey, Morris, Choi and Sanders, 2004). It also promotes feelings of strong community, common endeavour and ongoing socialisation, which are tenets of other adventure-based experiential education programmes, such as Outward Bound (Martin and Leberman, 2005).



*A student records benthic habitat data at Tūhua  
(photo: Marine Studies collection)*

The Marine Studies extended field trips involve collecting scientific data sets in the marine environment. Sometimes these are utilised by another organisation, for example the Department of Conservation (DOC), adding relevance and realism to the study from a participant perspective. On some of the field trips a portion of the data is collected from a marine protected area, where the survey results may be quite different from study areas without protection. These apparent differences may consolidate the students' developing perceptions of the benefits of marine conservation practices such as the creation of marine reserves.

The field trips examined in this study occur in either year one or year two of the Diploma in Marine Studies course. The Whitianga marine surveying field trip is the longest of the year one course and, in terms of this study, the only extended field trip that year. Here students are divided into small groups of around twelve individuals. As a group, they spend approximately 8 days away from home, learning underwater marine surveying techniques and in the process improving their diving skills. At this point in their training they are completing the Professional Association of Dive Instructors (PADI) Dive Master level qualification, which requires a minimum of sixty dives for certification. They spend the first half of the trip based on land at Whitianga (on the Coromandel Peninsula), and complete daily dive trips to local sites including the Hahei Marine Reserve. The second half of the trip is spent living on a dedicated dive vessel (M.V. Whai), which transports them around the nearby Mercury Islands.

In year two the student intake is divided into groups of around twenty-five individuals. Each group spends approximately ten days undertaking advanced marine surveying, supported by three Marine Studies staff members, at either Slipper Island or Tūhua (Mayor Island), both off the Bay of Plenty coast. The islands are remote from normal services and the groups need to be almost entirely self-sufficient. There are no shops, power is intermittent and generated on the individual islands, and cell phone coverage is limited.

The fourth extended field trip examined in this research is based on Lissenung, an isolated island in Papua New Guinea (PNG). Although these four diving and marine-related field trips are individually unique, they all involve:

- Staying in spectacular wilderness locations
- Direct personal interaction with the natural environment
- Very close association with supervising staff and peers
- Team work and co-operation
- Personal challenge
- Removal of participants from their comfort zones
- Augmenting skill sets and knowledge of the subject matter and the environment.

The questionnaire results revealed that the reasons most students initially enrolled in the programme included their interest in aspects of the marine environment (including diving and marine life). A large proportion of students were attracted by the practical and vocational opportunities provided by the course. Almost all of the students said they learn better in practical situations than in lectures, so it follows that the diving field trips, as experiential learning tools, would appeal to practical learners who enjoy diving and the marine environment and who are mindful of the vocational aspects of the learning. The techniques and skills learnt on these field trips reflect 'real world' work practices so are useful preparation for employment.

Almost 80% of respondents stated that the extended field trips were the single most memorable experience in both years one and two of their study, so these field trips were firmly established as matching the main reasons they wanted to do the course and the way they learn, as well as making a strong impression on the students. The vast majority of respondents considered that the extended field trips were highly relevant to their course of study and all the field trips were rated very highly by students as learning experiences. They also clearly understood the learning goals for the trips and recognised that the focus of the learning on the field trips changed subtly from year one to year two. In addition, the students stated very high rates of learning goal achievement.

The remote nature of the field trips leads to a disconnection from normal routines and this is further heightened by a strict 'no drugs or alcohol' policy on the trips. Interestingly 99% of the responses indicated no effect or a positive effect from this policy and 95% perceived no problem with or enjoyed the lack of access to home comforts. The lack of home comforts included limited cell phone coverage, or sometimes no coverage, and lack of everyday distractions may have enhanced participant involvement in their learning (O'Sullivan and Morell, 2002). In effect, students are living in an outdoor classroom and fall asleep and wake up surrounded by the natural environment. The positive effects of contact with the natural world are well reported however it also appears that degree of immersion in nature without the distractions of external stimuli may enhance positive community contributions and pro-social behaviours (Weinstein, Przybylski and Ryan, 2009).

Field trips take place in all weather conditions, which can sometimes include extremes, and diving activities continue even in uncomfortable conditions, as in the 'real world'. There were positive comments about how students felt after successfully completing work dives in difficult weather and most students commented that their confidence then increased and some said it improved morale. Overall the field trips enhanced general confidence in most respondents and it was firmly established that trust and teamwork were a major part of the learning experience. The students recognised a high level of trust is inherent in scuba diving and the majority liked working as a team and thought this had a positive effect on their learning. Indeed, key factors vital to successful learning in groups are the development of a climate of trust and psychological safety, which enhance group cohesion (Gardner and Korth, 1997; Kayes, Kayes and Kolb, 2005).

On the extended field trips students also spend a great deal of time with staff members, working and living together in often cramped and challenging conditions. Students on the first year Whitianga trip were asked about this, and they reported that their relationships with staff either improved or greatly improved over the course of the trip. This built positive relationships and may have facilitated improved subsequent knowledge transfer.

The field trips are designed to inspire and challenge the students and this clearly happened and almost all said they were highly inspired. Aspects that inspired them most were their own personal development and achievements, the environment, marine life and interpersonal factors. Most of the respondents held very positive views on marine reserves, and most perceived that their attitude had been strongly influenced by the field trips. In an age of disconnect from nature (Louv, 2006) and the need for advocacy for marine protected areas (Lester, Halpern, Grorud-Colvert, Lubchenco and others, 2009) it was important to establish if there was a link between the field trips and the participants' motivation to both share and act on key conservation messages. A very high percentage of respondents said their motivation to share the marine conservation message had changed due to the field trips and a high percentage stated their motivation to act on the message had been influenced. This finding further illustrates the multifaceted effects of the extended field trips on student development.



The overall comments on the field trips were overwhelmingly positive. Students liked the frequency and diversity of trips, the mix of practical and theoretical learning and the diving and scientific experience they gained. They recognised that the field trips increased their self-confidence and prepared them for the 'real world', and they appreciated the high level of organisation involved and the staff input. They also valued the life skills learnt, working with peers and making new friends, and memories they would have for life.

At Tūhua they had shared in a 'real world', important and relevant study supported by the Department of Conservation. They had collected vital data to meet the conservation goals of the partnership and contributed to a large and comprehensive data set that was being used to answer ecological questions on marine protected areas. The students at Tūhua had witnessed their supervising staff members working collaboratively with DOC staff and scientists, and had personally "lived" the proceeds of the science/education partnership. They had been mentally and physically challenged and inspired, and their motivation and resilience were tested. The overwhelmingly enthusiastic individual comments attest to the nature of the experience and the profound effect on some of the students. Examination of the Marine Studies experiential model of education revealed many layers of learning and personal development in the students involved. The science/education partnership at Tūhua has facilitated this learning for over twenty years and has congruently made a significant contribution to knowledge of the marine environment around Tūhua.

### Part 3. Tūhua Marine Reserve Monitoring - the science and results

Recovery of targeted reef fish numbers formed an important management objective of early marine reserves in New Zealand. This was the case for Tūhua Marine Reserve where it was expected that numbers of reef fish targeted by fishing would recover following full protection under a no-take management scenario. Accordingly, a monitoring program designed to measure changes in population numbers was established and implemented for a period of ten years (1993 - 2002). Monitoring data, collected over a twelve-year period by underwater visual census (UVC), where divers identify fish and record their size and number while swimming a predetermined distance and direction, was used to compare changes in reef fish numbers between these two zones. No evidence of recovery in reef fish populations was found in either zone over this time. It was also expected that there would be an edge effect in the marine reserve, with populations of targeted fish species higher in the centre of the reserve, but this was not found, suggesting fishing may have been occurring across this entire no-take zone. In some other smaller marine reserves with edge effects, numbers of targeted fish have increased over time. Results at Tūhua Marine Reserve suggested that while protection may have enabled a higher relative abundance of targeted reef fish species to exist in the full no-take zone than in the partially protected recreational fishing zone, other factors might explain the general lack of population growth in either management zone.

### Stepping up Compliance and Using Other Methods of Monitoring

After over ten years of being a fully protected marine reserve there was little evidence of any recovery of the key species. Source populations were available and fish could get to it, therefore there should have been increases in previously targeted reef fishes. This was confusing, as other similar marine reserves had demonstrated large short-term changes in key components of the reef fish assemblage following protection. A watershed workshop took place in Tauranga in 2005. This was called to address some of the questions around the Tūhua monitoring results. This workshop was critical as it brought scientists, resource managers and the community together in a discussion forum that provided direction to monitoring at Tūhua.

The lack of recovery in the reserve was puzzling for the scientists and managers involved as it was unexpected and dissimilar to what had happened in other fully protected areas. Questions were raised in the community about the utility of marine reserves if they didn't make any measurable difference. Members of the science community were critical of the monitoring design and using students to undertake the monitoring. There was also anecdotal evidence of continuing illegal fishing in the reserve, which would confound attempts to accurately assess fish numbers.

The Bay of Polytechnic/DOC partnership sought to address these concerns between 2002 and 2006 by reviewing the monitoring protocols. The original design of the monitoring programme, where sampling was stratified by habitat, did not allow for the influence of habitat variables to be separated from the influence of removing fishing pressure, so the decision was made to alter the surveying methodology. This was a bold and courageous move at that time, as it was believed that even small modifications to the monitoring process could render any previous data collected obsolete.

The annual reef fish monitoring at Tūhua had always used UVC techniques to count the species of interest. This is due to the flexibility in sampling that this allows. It also provides for the ability to collect data fast and the capacity to record extra habitat information while undertaking these dives. However, UVC has limitations in terms of observer bias, inability to monitor fish in water too deep for repeated diving and in altering the behaviour of diver-positive or diver-negative fish.

To counter these limitations, baited underwater video (BUV) was used at Tūhua in 2004 to augment the UVC techniques (Shears and Usmar, 2006). The authors of this report concluded that there appeared to have been no response by predatory reef fish to the protection afforded by the Tūhua Marine Reserve after ten years. Only very small numbers of Snapper were recorded within and outside the reserve. Fishing activity in the reserve had been observed while undertaking the annual surveys, further supporting the results of the edge effect study, which suggested that illegal fishing was occurring across the marine reserve. Conclusions were drawn that there had been little response to marine protection in Tūhua Marine Reserve due to illegal fishing and this was clouding the ability to accurately document ecosystem responses to protection (Shears and Usmar, 2006; Young, Ferreira, Jones and Gregor, 2006).

Consequently, DOC decided to increase surveillance and public education to attempt to combat illegal fishing. They moved from a 'passive' mode of compliance enforcement - where warnings and educational messages were conveyed - to an 'active' mode. This involved more and regular patrols at Tūhua, enhanced public education programmes and pursuing prosecutions for those caught fishing illegally. During this time regular, annual UVC monitoring was continuing and was beginning to show consistently higher numbers of fish inside the reserve compared to outside.

### Examining the Effects of Enhanced Compliance Enforcement

Before 2008, during what is referred to here as DOC's 'passive' compliance enforcement period for the Tūhua no-take reserve, in most cases where illegal fishing was suspected, suspects were provided with a verbal or written warning as opposed to being prosecuted. Indeed, for the 15-year period since gazettal (1993 to end of 2007) only 3 prosecutions occurred. In 2008, however, active compliance enforcement was implemented, resulting in 7 prosecutions in the 4-year period from 2008 to 2012. Active compliance enforcement was implemented through a range of measures. These included an increased staff presence in the reserve, the commissioning of a new vessel that enabled reserve patrols in rougher seas, and public education through 'state of the reserve' talks and dissemination of brochures and reserve information at fishing competition briefings.

To test the effects of active compliance enforcement, in addition to the annual UVC surveys, baited underwater video (BUV) techniques were adopted to assess the abundance of carnivorous fish at Tūhua in 2011. The use of this technology was designed to complement and extend the annual underwater visual census (UVC) surveying at Tūhua. This study was a repeat of previous BUV work in 2004 and it reinforced what the subsequent annual UVC monitoring was finding. Both BUV and UVC studies reported significant differences in fish numbers between the reserve and the adjacent partially protected areas where fishing was still allowed. These results further validated the decision to change the survey methodology in 2004 and confirmed that alterations in management practices in 2008 may be contributing to the recovery that was now apparent in the marine reserve.

There had also been an extension of the monitoring in 2004 from an individual species approach to an ecosystem-wide approach. The aim was to measure change in the wider marine assemblages as well as in individual species at Tūhua, capturing the shifting responses of a range of species expected to respond to full protection. These included a selection of fish, invertebrates and macro algae that were recorded throughout the annual UVC monitoring. This study was designed to trace the progress of recovery of the Tūhua Marine Reserve from 2004, and the data captured for the period from 2004 - 2012 was also used to establish if the 2008 management decision to increase active compliance enforcement and reduce illegal fishing had in fact made a difference four years later.



*A student performs crayfish surveying in dense Ecklonia forest  
(Photo: Paul Warren)*

Research results indicated that snapper, tarakihi, and red moki had responded positively to increased protection in the marine reserve. The relative abundance of all sizes of snapper was more than twice as high (2.4-fold increase) during the active compliance enforcement period than during the passive compliance period. For legal-sized snapper (>300mm) this increase was 4.3-fold. These differences were statistically significant (all snapper  $P=0.012$ ; legal-sized snapper  $P=0.01$ ). The number of tarakihi was also higher in the period of active compliance enforcement although this difference was not statistically significant ( $P=0.34$ ). Red moki were 1.38 times more abundant in the marine reserve in the active compliance enforcement period than in the passive compliance period. Note, however, that this was statistically significant only at the 10% confidence level ( $P=0.06$ ). The differences in snapper numbers were most likely due to increased protection and not simply to a

regional increase in reef fish abundance, because the number of snapper did not increase in the restricted fishing area as it did in the marine reserve. Moreover, the increase in number of legal-sized snapper in the marine reserve in the active compliance period was twice that of snapper of all sizes.

Our results are consistent with the response of snapper in reserves elsewhere in north-eastern NZ (e.g. Denny, Willis and Babcock, 2004) and support the findings of a recent baited underwater video survey (Morrison & Gregor 2013). That survey found a significant difference in the number of snapper inside the marine reserve compared with the restricted fishing area, which was not observed in 2004, and a 10% increase in the average size of snapper inside Tūhua Marine Reserve.

The increase in the number of red moki in the marine reserve following increased protection is consistent with the response of red moki to protection elsewhere (e.g. Cole, Ayling and Creese, 1990). Unlike snapper and tarakihi, however, red moki are not a targeted fish and do not form a valuable part of New Zealand's recreational or commercial fishery. Therefore, the increase in red moki in the marine reserve but not in the restricted fishing area suggests that other limiting factors may be decreasing or have been removed. Indeed, numbers of this species had been increasing prior to the implementation of active compliance enforcement in 2008 and so other factors may also have been driving the recovery of this species in the marine reserve. The lack of a statistically significant increase in tarakihi is not surprising. Tarakihi are highly mobile (see Langley & Starr 2012), and may not be resident to any particular reef system.

Taken together, the results supported the importance of active compliance enforcement in the Tūhua Marine Reserve to enable both greater recovery of targeted reef fish species and to validate the measurement of longer-term ecosystem changes through the comparison of management zones. The research underlines the importance of active compliance enforcement as an integral part of Tūhua Marine Reserve management. Marine protected areas with limited or poorly implemented compliance enforcement regimes, as had been experienced at Tūhua, may offer limited ecological benefit. In fact, the delay of successful recovery of key protected species like snapper can also undermine public perceptions of the value of marine reserves and hinder their establishment elsewhere.

#### Part 4. Going forward – the 10-year plan

The intention is for Marine Studies students and staff members from Bay of Plenty Polytechnic to continue the annual surveys, in collaboration with the Department of Conservation and the Tūhua Trust Board, as has been the case since 1993. All the participants have strongly endorsed the partnership and the model is working well. In the 10-year plan, the current methodology will continue - annual ecosystem-based monitoring interspersed with Baited Underwater Video surveys - and these will be complimented by additional research on productivity and resilience studies that will further inform the recovery story at Tūhua. The key performance indicators and long-term expectations of the protection regimes at Tūhua are further developed in the plan which identifies survey format and periodicity as well as reporting timelines.

#### Conclusions

The marine reserve monitoring at Tūhua over the last twenty years could never have been maintained without the support and hard work of the students and staff members from Bay of Plenty Polytechnic with the assistance of the Department of Conservation and the Tūhua Trust Board. This unique science and education partnership has stood the test of time. There have been significant challenges in terms of understanding the marine ecological processes involved, and although significant gains have been made, there is still a long way to go.

Empirical evidence has driven management decisions and precipitated bold moves to support understanding of underlying processes involved with rebound in species assemblages at Tūhua. The effective feedback loop between evidence and management action has worked well and provides a useful template for other marine protected areas. Knowledge of the incremental changes in and around Tūhua Marine Reserve has been disseminated throughout the science community and to the public through publications, workshops and presentations of results to a variety of groups.

The students involved in the monitoring at Tūhua have also gained considerable benefit from their participation in the partnership. They have increased their knowledge and skills and gained self-confidence and motivation. They have been immersed in spectacular environments with skilled and experienced staff members and had the opportunity to challenge themselves in a model of learning that is founded on outdoor and adventure experiential learning. This model also draws on aspects of environmental education and students return to the mainland from these extended trips with greater environmental knowledge and conservation awareness. They have enhanced motivation to share and act on marine conservation messages. This is a long-running saga set against a wild and unpredictable background, which will continue with the concerted effort and collaboration of the key partners.



*Student surveyors relaxing together at Opo Bay, Tūhua.  
(Photo: Stephanie Jefferies)*

The Tūhua project has had widespread and positive effects on the students and staff members involved over many years. The partners all support a future that involves continuity of the annual monitoring to address some of the outstanding ecological questions. These are being incrementally worked through to improve understanding of the Tūhua Marine Reserve and ultimately the wider marine environment.

Discussion around the broad themes of marine protection is topical and often controversial. This will continue, as increasing pressure is applied to the marine environment at both local and global scales. Collaboration and education will remain central parts of the pathway to sustainability and recovery at all scales, and it is important that experiential education remains a key component of this road to a brighter future.



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*Te Rangahau Taiao  
ki Awanuiārangi*

## CHAPTER TWO

# MĀORI MARINE MANAGEMENT

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## Abstract

This study investigates marine management of Māori taonga (treasured) species in Aotearoa New Zealand, namely the kūtai, *Perna canaliculus*, green-lipped mussel populations in Ōhiwa harbour. It provides quantitative marine field research on the current state of the mussel populations along with its most voracious predator, the eleven-armed seastar in the western side of Ōhiwa harbour. Results of the marine field research identify an alarming ninety-eight percent (98%) of the traditional mussel populations are no longer present. The research recommends a new approach to marine management that identifies and removes barriers to participation; considers a plurality of perspectives; seeks greater ecological knowledge; and recognises understandings of complexity, and uncertainty as they relate to marine management decision-making and policy, planning processes. Finally, the study supports one government agency be identified and held legislatively responsible for assisting the marine management of Māori taonga species in Aotearoa New Zealand.

## Introduction

Situated in the Eastern Bay of Plenty, Ōhiwa harbour sits on the outskirts of Whakatāne and is bordered by the districts of Ōhope, Wainui and Kutarere. A 26.4<sup>2</sup> estuarine lagoon, Ōhiwa harbour is bordered by the 6km Ōhope spit on the west and the 0.7km spit on the east (Richmond, Nelson & Healy, 1984; Davies, 1977; Park 1991; Morrison, 1996; Bay of Plenty Regional Council [BOPRC], 2013).

The catchment area of Ōhiwa harbour begins approximately thirty-five kilometres inland and covers one hundred and seventy-one square kilometres. It includes forestry, dairy/drystock farming, horticulture, residential living, and lifestyle blocks. In the upper catchment, approximately half of the land is in pasture, with the other half vegetated by indigenous and exotic forests. The harbour lies between the rapidly uplifting Raukūmara Ranges (East Cape) and the subsiding Whakatāne Graben (Robinson, 2012, Park, 1991). Twelve major rivers and streams discharge freshwater directly into the harbour, with Nukuhou River the most significant contributor (Environment Bay of Plenty [EBOP], 2006; BOPRC, 2013).

Approximately 3,500 people reside in the water catchment area of Ōhiwa harbour and, of those, two thousand are situated in the Ōhiwa, Ōhope, Kutarere settlements (EBOP, 2006). Ōhiwa harbour is a busy summer holiday destination and a popular recreational area for water skiing, fishing, boating, kayaking and diving activities (Robinson, 2012; BOPRC, 2013).

Ōhiwa harbour is a drowned river valley with a diverse geology (Robinson, 2012, Richmond, 1977; Richmond et al, 1984). Most estuaries have limited geological life spans and tend to continually infill over time. Ōhiwa harbour is rapidly changing and infilling. These processes have been dominated by the open coastal supply of sediment, particularly in the entrance of the harbour, where rapid change in channel size and shape continues to take place (Park, 1991; BOPRC, 2013). Sediment that fills the harbour is mainly supplied by littoral drift from the Rangitaiki Plains, with a smaller component delivered from the Motu River to the east (Robinson, 2012).

The harbour is tidally dominated and is extremely shallow, with eighty percent of its total area subjected to exposure at low tide (Richmond et al, 1984; Park, 2005; EBOP, 2006). Ōhiwa has freshwater from inflowing streams and rivers inter-mixing with seawater as it flows in and out of the harbour (McLusky & Elliot, 2004). The entrance is the deepest, with the tidal channel

scoured down the middle due to the heavy movement of tidal and river flows continuously moving in and out of the harbour. The strong velocity of currents in the areas closest to the harbour entrance prevents finer particles of sand and silt from depositing, and therefore coarser sediment dominate the substrate (Morton & Miller, 1968, Hume & Swales, 2003).

Ōhiwa is steeped in the significant history of Māori who have lived and harvested from the harbour. The harbour lies within the ancestral homelands of Ngāti Awa, Te Ūpokorehe, Te Whakatōhea and Tūhoe (Waimana Kākū), and their inter-generational activities have resulted in a high number of cultural and archaeological sites in and around the harbour.

For Māori, Ōhiwa harbour has immense value and importance as a place of great cultural and historical significance. For generations of Māori, Ōhiwa harbour has served as a traditional food gathering place for shellfish and seafood (Morrison, 2007).



Ōhiwa Harbour (Photo: Daniel Wells)

The significance of green-lipped mussels in the socio-cultural practices of Māori extends back to prehistoric times, with mussel shell remains identified in Māori middens throughout the country (Morrison, Lowe, Jones, Makey, Shankar, Usmar & Middleton 2014). However, throughout the years increased harvesting pressures and changing environmental conditions have taken its toll on Ōhiwa harbour (Paul, 1966; EBOP, 2006). The traditional, customary shellfish species of kūtai, *Perna canaliculus*, green-lipped mussel have struggled to maintain its existence, in the once abundant food basket of Tairongo <sup>1</sup>.

In an effort to preserve traditional mussel populations in the harbour, conservation measures have been actively sought and implemented by Māori to redress the detrimental effects of changing ecosystems and severe depletion of the shellfish communities in Ōhiwa harbour (Iwi, Hapū, Working Party, 2005). The need to actively implement effective natural resource management principles and concepts of kaitiakitanga (active guardianship), in determining and managing

<sup>1</sup> The traditional name for Ōhiwa harbour is Te kai a Tairongo or the food basket of Tairongo, an important Māori ancestor who upon seeing Ōhiwa proclaimed the significance of a harbour with a ready supply of food requiring little to no effort to prepare.

kūtai populations is a priority for Māori authorities.

By the mid-1990s a series of resource consent applications were made to the local and regional Council authorities for the development of/on/in sites of ecological and cultural significance to Māori in the harbour. These applications prompted the neighbouring iwi/hapū of Te Ūpokorehe, Ngāti Awa, Te Whakatōhea and Tūhoe to initiate a combined working relationship for the care and protection of Ōhiwa harbour and the customary, taonga species in the harbour.

In recognition of kaitiakitanga for Ōhiwa harbour and in response to iwi/hapū efforts, an integrated management strategy for the harbour and its surrounding catchment was initiated by the Bay of Plenty Regional Council in 2002. In further support of the integrated management strategy the Whakatāne District Council invited the neighbouring iwi/hapū to develop planning tools including draft processes in providing for kaitiakitanga (active guardianship) in the harbour (Iwi, Hapū Working Party, 2005).

By June 2003 an Iwi/Hapū Forum was established. With the support of a sponsored consultant the working party of the iwi/hapū forum was instructed to perform two specific requirements (1) to construct a draft Iwi/Hapū Position Paper relating to *ownership and governance* issues regarding the foreshore and seabed of Ōhiwa harbour and (2) to draft a common set of planning tools including principles, processes and protocols to provide for the co-operative kaitiakitanga of Ōhiwa harbour.

In 2006 the Draft Ōhiwa Harbour Strategy was released by the Bay of Plenty Regional Council in collaboration with Ōpotiki District Council, Whakatāne District Council, Ngāti Awa, Te Ūpokorehe, Te Whakatōhea and Tūhoe. In 2007 a Hearing Committee comprising representatives of the Bay of Plenty Regional Council, the Whakatāne and Ōpotiki District Councils and the four-neighbouring iwi/hapū of Ōhiwa harbour, heard submissions on the 2006 Draft Strategy and recommended amendments to it. In 2008 the Bay of Plenty Regional Council released the updated Ōhiwa Harbour Strategy. To ensure and oversee the implementation of the identified issues and concerns the Ōhiwa Harbour Implementation Forum (OHIF) was established. The OHIF forum consists of representative Councillors from the respective Council Partners and Iwi Representatives from the neighbouring iwi/hapū. A further forum to manage the OHIF was also established, called the Ōhiwa Harbour Strategic Co-ordination Group (OHSCG).

During this period Te Ūpokorehe Hapū formally lobbied the Ministry of Primary Industries (Fisheries) for the implementation of a rāhui<sup>2</sup> (temporary marine harvesting closure), preventing any taking of kūtai, from the whole of Ōhiwa harbour. In July 2006, a further application for the extension of the rāhui on the mussel beds in Ōhiwa harbour was granted and a new 186A closure, preventing the taking of green-lipped mussels was implemented for a further two years. In 2007, with the 2006 rāhui due to expire on 20 July 2008, it was becoming imperative that a formal survey regarding the status of the mussel bed populations be undertaken. In recognition of the work undertaken by Te Ūpokorehe in establishing and implementing the previous rāhui in 2003 and 2006, Te Rūnanga o Ngāti Awa initiated and funded the surveying of mussel bed populations in the western side of Ōhiwa harbour. The findings of the 2007 mussel bed surveys resulted in Ngāti Awa successfully lobbying the Minister of Fisheries for a further two-year extension of the rāhui for the period, November 2008 to October 2010.

In 2007 mussel numbers in the western side of Ōhiwa harbour were estimated at one hundred and fifteen (115) million with a total of seventy-six percent (67%) measuring between 0-20mm in

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2 Rāhui or closure is a traditional resource management measure which prohibits the taking of identified species from a specified area.

width. In 2008 an estimated sixty (60) million mussel were present with sixty-five percent(65%) sampled measuring between 21-40mm in width.

In 2009 an estimated sixteen (16) million mussel were present with sixty-nine percent (69%) of all mussels sampled measuring in the harvestable size of 41-60mm in width. In 2009, it was found that a significant seventy-eight percent (78%) decrease in mussel numbers had occurred. On 14 April 2009, it was found that forty-nine point four percent (49.4%), of the original mussel bed boundaries had disappeared. By 4 June 2009 it was found that a total of fifty-seven point twenty-two percent (57.22%), of the original mussel bed boundaries in the western side of Ōhiwa harbour were no longer present.

### Kūtai, *Perna canaliculus*

Kūtai as a taonga species is recognised by The Ministry of Fisheries (2008), The Mai i ngā kurī ā-Whareki ki Tihirau Fisheries Forum Plan (2012, p.22) and The Draft Regional Coastal Environmental Plan, 2012 (or RCEP, 2012).

Kūtai, *Perna canaliculus*, green-lipped mussels are unique to Aotearoa, New Zealand: they are found nowhere else in the world (Department of Conservation, 2000). Green-lipped mussels are distributed throughout much of the country, although they more frequently occur in the central and northern regions of the North Island (Jefferies, Holland, Hooker & Hayden 1999; Cook, 2010; Nybakken & Bertness, 2008). Green-lipped mussels can be distinguished from other mussel species by their geographic origin of Aotearoa, New Zealand and their interior emerald colouration around the shell margin (Jefferies, et al, 1999).

Green-lipped mussels can be found in a variety of habitats; anchored to solid substrates such as rocky faces, wharf pilings and algal holdfasts or in clusters on muddy or sandy bottoms in sheltered bays. There is intense competition for space on the soft, sub-tidal shore, with growing mussels constantly competing for space. If one mussel dies or is removed, surrounding mussels will quickly grow to assume the empty space. This also ensures the integrity of the bed, leaving no space available for other species to gain a foothold in an extremely competitive environment (Bradstock, 1989).

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Green lipped mussels - Ōhiwa Harbour (Photo: Kura Paul-Burke)

Mussels have several predators including humans, seabirds, crabs, gastropods (spiral shell animals) such as the Speckled Whelk (*Cominella adspersa*) and Purple-mouthed Whelk (*Cominella glandiformis*). In the temperate waters of Ōhiwa harbour the most common seastar predator of green-lipped mussels are presumed to be *Coscinasterias muricata*, the eleven-armed seastar and to a lesser extent, *Patiriella regularis*, the cushion star and *Stichaster australis*, the reef star (Nybakken & Bertness, 2008; Bradstock, 1989; Hickman, Roberts, Larson & l'Anson 2004).

#### Pātangaroa, *Coscinasterias muricata*, Eleven-armed Seastar

There are hundreds of different species of seastars in Aotearoa, New Zealand; unfortunately, “many aspects of their physiology, nutrition, reproduction and even anatomy still are not well known” (Lawrence, 2013, p. ix). Able to reach up to 250 millimetres in diameter (Sewell, 2010), the seastar has between ten and twelve arms which it uses to arch and slide itself over the mussels. With strength and persistence, its many hundreds of tube feet slowly increase pressure on the mussel valves. Eventually the mussel is unable to withstand the opposing forces between its two shells and relaxes the abductor muscle, allowing the seastar to insert its everted stomach between the two valves and feed (Morton, 2004; Bradstock, 1989; Morton & Miller, 1968).



Seastar approaching mussels (Photo: Kura Paul-Burke)

Like many other asteroids (seastars) *Coscinasterias muricata* can locate their prey by odours or chemoreceptors (Lawrence, 2013; Inglis & Gust, 2003; Barker, 2013) and reduce active foraging when prey is abundant. The seastar can sense or smell their prey, whether the prey is epifauna (organisms that live on top of the sediment surface of the harbour floor) such as mussels, or infauna (organisms that bury themselves within the bottom sediments of the harbour floor) such as pipi.

Adult seastars avoid predation with strong chemical defenses such as saponins, which are often described as extremely unpleasant or foul-tasting compounds located under the armoured skin.

Previous research studies in Ōhiwa have also identified a significant presence of seastars (*Coscinasterias muricata*, Eleven-armed Seastar) in the western side of the harbour (Burke, 2009; Moke, 2008; Paul-Burke, 2008, 2009) and it is suspected that the seastars may be negatively affecting the diminishing mussel populations.



*Seastar feeding on mussels (photo: Kura Paul-Burke)*

Burke (2009) assessed biomass, population density and rate of movement of seastar populations within the mussel bed boundaries in the western side of Ōhiwa harbour. Burke (2009) also sought to ascertain if the removal of seastars (Moke, 2008) was a potentially viable or practicable management option, in regard to time, effort and resourcing. The results from the 2009 seastar snapshot survey found an estimated one point two (1.2) million seastar located within a concentrated area of 38,872 square metres (approximately 3.9 hectares or 9 acres). Seastar measurements recorded an average of 31-40cm with the largest sizes recording 41-50cm in diameter. The estimated total biomass of the seastars was six hundred and seventy-two (672) tonnes.

The 2009 findings indicated that a removal programme of six hundred and seventy-two (672) tonnes of seastars from the western side of the harbour would require significant resourcing, effort and financing. In addition, the research highlighted that many aspects of biotic (biological) and abiotic (environmental) factors regarding mussel and seastar populations in Ōhiwa harbour were still largely undetermined. It was essential to gain a better understanding of the impact seastars were having on the mussel populations.

## Historical information

In 1840, the Treaty of Waitangi was signed by Māori chiefs and select dignitaries of the British Crown. Five years earlier (in 1835) a Declaration of Independence was signed by thirty-four Māori chiefs. The Declaration of Independence 1835 was acknowledged by King William IV and duly recognised in Britain and internationally. The Declaration of Independence 1835 recognised “All sovereign power and authority within the territories of the United Tribes of New Zealand is hereby declared to reside entirely and exclusively in the hereditary chiefs and heads of tribes in their collective capacity...” (He Whakaputanga o te Rangatiratanga o Nu Tirene: Declaration of Independence of New Zealand, 1835).

This recognition of Māori sovereign status posed a legal problem for British colonial subjects residing in Aotearoa, New Zealand as it impeded acquisition of Māori land, economy and powers of sovereignty (Durie, 1998; Waitangi Tribunal, 2011). In response, the Treaty of Waitangi 1840 was quickly established to over-ride and counter the Declaration of Independence 1835 and the potential for a Māori-led state (Durie, 1998; Walker, 1990; Forster, 2012). After the Treaty of Waitangi was signed in 1840, “the state and local authorities assumed an increasing degree of management and control of the New Zealand land resource, initially for the purposes such as the orderly settlement and growth of the country, and later (through various planning acts) to control the use and development of land” (Stephenson, 2001, p.163).

In 1867, over one million acres of land from iwi/hapū within and around the Bay of Plenty was confiscated by the Crown. Included in the confiscations was Ōhiwa harbour (Iwi, Hapū Working Party, 2005; EBOP, 2006; BOPRC, 2008). As a direct result of the land confiscations Māori struggled to overcome the position of people dispossessed of land, cultural practices, language and identities (Iwi, Hapū Working Party, 2005).

For decades Māori strove to overcome a dominant western infrastructure, which positioned itself as the ‘owner’ and ‘rule-maker’ over the natural resources in Ōhiwa harbour. Despite intentions, legislative planning processes have not been well implemented, and/or given adequate recognition to enable Māori to effectively participate in decision-making forums on sustainable development issues (Brake & Peart, 2013; Stephenson, 2001). Māori are increasingly dissatisfied (Te Puni Kōkiri, 2013; Waitangi Tribunal, 2011), levels of effective engagement processes remain low and under-resourced (Jollands & Harmsworth, 2007), and the abilities of Māori to give effect, to cultural notions of sustainable development and management over natural resources is disjointed and limiting (Reid, Barr & Lambert, 2013).

## Kaitiakitanga – Active guardianship

In traditional Māori society, any action or decision-making undertaken by a hapū (sub-tribe) or iwi (wider tribal kinship grouping of people) was governed by tikanga (customs) and kawa (protocols) to ensure the maximum benefit and betterment of the collective. This included not only social, cultural and economic benefits but environmental as well. From the traditional Māori perspective, this process encompassed a holistic world view which saw the need to nurture and protect the environment in order to nurture and protect the people (Iwi, Hapū Working Party, 2005).

This concept is known as kaitiakitanga (active guardianship) which is the effective influencing and management over the use and sustainability of resources. The practice of kaitiakitanga is commonly associated with an active act of guarding, protecting, nurturing, preserving, sheltering, conserving and/or keeping watch over the natural world and the resources within it (Marsden, 2003). Kaitiaki are agents that perform the tasks of guardianship. They are charged with the

responsibility to safeguard and manage natural resources for future generations (Jollands & Harmsworth, 2007; Iwi, Hapū Working Party, 2005). Decisions enacted by kaitiaki are based on the guidance and support of kaumātua and kuia (male and female tribal elders) and their collective understandings of a particular resource. For Māori, kaitiaki relationships with the natural world are a fundamental expression of Māori culture and identity (Waitangi Tribunal, 2011). In essence, kaitiakitanga addresses the diverse realities of a modern world and the ability to effectively inter-weave the past with the future, in accordance with tikanga of Māori tribal and sub-tribal entities, for the betterment of ourselves and the natural world around us (Iwi, Hapū Working Party, 2005).

### Māori marine management

From a Māori worldview, the vitality or health of a species and its environment is encapsulated with life-sustaining energy. This is called mauri, which is most commonly translated to mean life-force or life-energy. Mauri is a prerequisite for life itself and is described by Young (2004) as the “life-force and personality possessed by each thing... a tree has mauri, but so also does the forest of which it is a part” (p.50). When mauri is absent there is no life. Of all spiritual concepts mauri is one of the most precious (Marsden, 2003). Kaitiakitanga as the process by which mauri is protected has deep spiritual and elemental significance. In Aotearoa, New Zealand, Māori are significant resource owners and participants in the New Zealand economy. As resource owners, Māori groups have been intimately involved in ensuring the sustainable development of their resources for hundreds of years (Jollands & Harmsworth, 2007; Leach, 2006; Reid et al, 2013).

However, legislative policies and practices pertaining to sustainable development have, more often than not, been subjected to interpretation and the “pervasive expression of power through institutions that monitor, measure and control” (Magee, Scerri, James, Thoma, Padghem, Hickmott, Deng & Cahill, 2013).

Contemporary management regimes of marine habitats, species and ecosystems are increasingly being shaped by conceptual understandings of sustainable development and sustainability. Underpinning sustainable development as a key concept, is the integration of economic, social and environmental considerations in decision-making (Mitchell, 2002). The ability for Māori to actively participate in decision-making forums concerning issues surrounding sustainable development is legislatively recognised in the Local Government Act 2002 (LGA). Under the LGA, a purpose of local government is to promote the sustainable development approach at a local level. The LGA requires local government to provide opportunities for Māori to contribute to its decision-making processes, Section 14(1) (d). Local Councils must establish and maintain processes to consider ways in which it may foster the development of Māori capacity to contribute to the decision-making processes of Council (Nolan, 2011). Councils must also consider the relationship of Māori and their culture with their ancestral land, water, sites, wāhi tapu (sites of significance), valued flora and fauna, and other taonga (LGA 2002, s77(1)(c)).

### Sustainable Management

Sustainability or sustainable management, at its broadest and simplest, positions the integrity of ecological environments and ecosystems as priority (Brake & Peart, 2013; Harding, Hendriks & Farqui, 2009). In Aotearoa, New Zealand the Resource Management Act 1991 (RMA) is an Act of Parliament. The RMA promotes the sustainable management of natural and physical resources such as land, air and water. New Zealand’s Ministry for the Environment (MfE) describes the RMA as New Zealand’s principal legislation for environmental management (Ministry for the



Environment, 2010). Sustainable management under the RMA seeks to ensure the integrated management of natural and physical resources, involving a balance between environmental protection and development, focusing on ecological rather than social or economic issues (Nolan, 2011; Von Roon & Knight, 2004).

In practice, this has meant enabling development to occur while seeking to maintain environmental quality. For Māori, the RMA has been of mixed benefit. The RMA recognises the importance of the many relationships between the culture and traditions of Māori with the natural world (Office of the Parliamentary Commissioner for the Environment, 2002; Brake & Peart, 2013). References pertaining to the Treaty of Waitangi are included in the RMA, in recognition of Māori interests in the use, management and development of resources (Nolan, 2011). However, the reality of implementing references of Māori resource management interests in the RMA and LGA into action, is fraught with deficiencies (Forster, 2012).

Under the RMA decision-makers must have particular regard to kaitiakitanga and to take into account the principles of the Treaty of Waitangi (s8). “However, relationships between Māori and the planning process have not been well provided for in some cases and there needs to be improved protection of the features of the coastal environment that hold special value for Māori.” (Brake & Peart, 2013, p.151). Unfortunately, many Māori hold significant concerns to “those aspects of the environment that are controlled by the Resource Management Act.” (Waitangi Tribunal, 2011, p.20). Similar to the LGA, the state response to recognising Māori interests is to focus on the Treaty principle of ‘participation’. However, for many Māori, sustainable resource management is about the re-distribution of power, not just the ‘ability to participate’ (Forster, 2012).

Although kaitiakitanga is included in the RMA (s7). It is defined as “... the exercise of guardianship; and in relation to a resource, includes the ethic of stewardship based on the nature of the resource itself.” Māori are of the view that it is inappropriate for the Crown to define by statute, an important Māori spiritual and cultural dimension” (National Māori Congress; New Zealand Māori Council; New Zealand Māori Women’s Welfare League, 1991).

Indeed, Western understandings of resource management differ in several ways from the traditional values and cultural practices of kaitiakitanga. Unfortunately, the resource management initiatives that have emerged from out of the RMA by government departments are a poor reflection of a Māori environmental ethos (Forster, 2012; Brake & Peart, 2013).

A Māori holistic approach to the natural world of ecosystems and inter-related relationships is in sharp contrast to the dualism of a Western construct which sees humans as isolated, superior and separated from the natural world. It is this segregated approach that western conservation and preservationist paradigms are based upon.

Within that segregated system the history of Aotearoa fisheries and management is a tale of overwhelming over-exploitation, depletion and exhaustion of fish species stock since the time of European settlement (Leach, 2006), indicating that the western ideology of marine management is both inappropriate and unrealistic. Our marine environment is valued for its commercial abilities, individually, locally, nationally and globally.

For decades, the decision-makers have managed fish stocks from a single-species approach. This approach has in turn resulted in policies which dictate commercial quota, catch limits, gear restrictions and incentives to not fish, belatedly implemented for the preservation of one specific species stock at a time. The loss and destruction of marine habitats, has resulted in essential survival mechanisms such as feeding and breeding along with nursery ground sites struggling to maintain an equilibrium, with some close to extinction (Peart, 2005).



Without question, the review of marine environmental management is necessary. The impact of human pressure is so extreme that not only are we in danger of destroying our fish stocks but of permanently damaging the equilibrium of our natural environments.

## Methodology

The overall purpose of the study was to strengthen the abilities of Ngāti Awa and Te Ūpokorehe to make informed, evidence-based decisions towards the sustainable management of treasured customary green-lipped mussel populations for present and future generations. It was intended that Ngāti Awa would receive evidence-based information pertaining to the state of mussel populations in the western side of Ōhiwa harbour while Te Ūpokorehe Hapū would be supported in the establishment of baseline surveys and on-going monitoring programmes of mussel populations in the eastern side of the harbour.

In addition, there had been no quantitative dive sampling for several years and with outdated research from 2007-2008, there was no provision of evidence-based information on the present state of the identified customary species, kūtai, *Perna canaliculus*, green-lipped mussel populations in the whole of Ōhiwa harbour. There was also no current, evidence-based information on the presence and impact of Pātangaroa, *Coscinasterias muricata*, eleven-armed seastar on the mussel populations in the harbour which had been identified as an area of increasing concern (BOPRC, 2013).

Therefore, the intention of the thesis study was too;

1. Undertake quantitative field research of the mussel bed populations in the western side of Ōhiwa harbour.
2. Utilise the findings from the western side of the harbour to support the establishment of evidence-based research in the eastern side of the harbour.
3. Develop and implement a management action plan for all mussel populations in all areas of Ōhiwa harbour, in collaboration with the relevant Māori authorities.
4. Evaluate the effectiveness of the research design for further potential replication studies.

This study was initiated by Te Rūnanga o Ngāti Awa and Te Ūpokorehe Hapū Resource Management Team and supported by the Manager of Land Management for the Bay of Plenty Regional Council who is also the Committee Champion for the Ōhiwa Harbour Implementation Forum (OHIF).

The research utilised a multi-methodological approach that involved a complex set of interconnected concepts and disciplinary approaches including; marine policy, environmental management and mātauranga Māori. Technical skills applied were marine ecology, marine science field research methods, stakeholder consultation and engagement. The research was informed by kaupapa Māori theory, resilience and complex systems theories within ecological and socio-ecological contexts, post-normal science and quantitative marine field research methods.

Located in a kaupapa Māori research paradigm Maori ways of knowing, being and doing are validated and legitimized. Kaupapa Māori research provides a means by which Māori researchers can approach research in a distinctively Māori way (Pihama, 2010; L. Smith, 1999; Bishop, 2008). The author's kaupapa Māori positioning is born out of experiential learnings and understandings of traditional western researchers working with Māori. Her own iwi of Ngāti Awa and that of Te Ūpokorehe have had many western researchers undertake projects within the respective tribal boundary areas. Rarely have the research findings been shared and authenticated by participating

iwi members and the communities from whence the knowledges came. As a result, the community is none the wiser or better for the researcher having ever been there. The practices of the western researcher are considered disrespectful to tribal peoples that support and assist with research projects and researchers. Therefore, Kaupapa Māori is a theory of change. It attempts to empower communities by using the past as a learning tool in conceptualising what Māori need to do to ensure that our research practices and processes are respectful, ethical, truthful and transparent (G. Smith, 2012).

Kaupapa Māori principles that guided this research included:

1. Aroha ki te tangata (respect for people)
2. Kanohi kitea (the seen face, present yourself face to face)
3. Titiro, whakarongo, kōrero (look, listen... then speak)
4. Manaaki ki te tangata (share and host people, be generous)
5. Kia tūpato (be cautious)
6. Kaua e takahia te mana o te tangata (do not trample over the mana (personal prestige) of people)
7. Kaua e māhaki (do not flaunt your knowledge) (Te Awekotuku (1991).

Principles of whakawhānaungatanga-kotahitanga, manaakitanga, kaitiakitanga and rangatiratanga - also supported the research process (Kennedy & Cram. 2010). Under a whakawhānaungatanga approach the researcher ensured that the research would contribute to the collective aspirations of Te Ūpokorehe and Ngāti Awa and that research methods and practices were appropriately (intellectually, culturally, socially and spiritually) identified and applied.

### Quantitative Marine Field Research Methods

The quantitative dive field work commenced at the pre-determined traditional sites of significance previously identified by Ngāti Awa experts and consistent with the former 2007-2009 monitoring efforts conducted in the western side of Ōhiwa harbour. Field work consisting of underwater (dive) sampling surveys in the western side of the harbour were conducted between the months of April-June 2013.

Evidence-based information was obtained on the current distribution, sizing and abundance of identified species kūtai (*Perna canaliculus*, green lipped mussel) and pātangaroa (*Coscinasterias muricata*, eleven-armed seastar) in the western side of the harbour.

Distribution bed boundaries of mussel populations in the western side of Ōhiwa harbour were mapped utilising the original 2007 GPS coordinates. Once the original 2007 bed locations had been assessed, the divers then proceeded to identify and map the contemporary sub-tidal mussel bed boundaries in the western side of the harbour.

All contemporary underwater mussel bed boundary areas were marked using WGS84 marine GPS system. The GPS coordinates of the exact size and shape of the current mussel bed boundaries in the western side of Ōhiwa harbour were then translated into visual GIS (geographical information system) maps. It was anticipated that the mapping of contemporary sub-tidal mussel bed boundaries would assist decision-making processes for the relevant Māori authorities and participating management forms of Ōhiwa harbour.

Once the sites of significance had been identified, the numbers and sizing of the quantitative marine field research dive work was able to be identified (Kayes, 2009). The sampling of green-lipped mussels was conducted using a random sampling method of randomly placing a 0.25m<sup>2</sup> quadrat within the identified bed boundary under survey (MacDiarmid, 2008, Kingsford & Battershill, 1998). All mussels inside the quadrat were counted and measured. The sampling of seastars was conducted utilising a systematic sampling method (Kaiser, Attrill, Jennings, Thomas, Barnes, Brierley & Raffaelli, 2011; Morrison, 1996) involving kick cycles (PADI, 2004) and the placement of a 1m<sup>2</sup> quadrat within the mussel bed area under survey.

Every dive in the western side of Ōhiwa harbour consisted of a principal research diver (the diver responsible for the sampling of a species in a particular area) and a safety buddy diver. The role of the buddy diver was to assist the research diver with a pre-dive safety check before every survey dive and provide emergency assistance (PADI, 2004) if required. The pre-dive safety check consisted of the estimated dive time, dive depth, gear check and generalised area the dive would be conducted in.

While the principal research diver was conducting underwater sampling efforts, the buddy diver was responsible for the collection of photographic images using an underwater housing and camera units, as well as assisting the research diver if required. A boat person was also present for every sample dive undertaken. The role of the boat person was to drop off and pick up divers, watch for diver bubbles (diver bubbles are physical signs which are visible from the surface and indicate a diver's location while they are underwater). The boat person was also responsible for the organisation of all diver survey gear for that day. The dive gear consisted of slates, underwater yuppo<sup>3</sup> and specialised dive survey equipment required for dives with particular species. Yuppo was used to record species sizing, abundance and substrate conditions during the underwater surveys. Each time a diver entered the water a dive flag was flown to alert other boats that divers were in the water, to ensure maximum safety during surveying dives.

A case study approach was then applied to gain an in-depth understanding of the Green lipped mussels in Ōhiwa Harbour, and to conduct extensive exploration and analysis. The case study approach drew on multiple methods in different disciplines of marine science and ecology; mātauranga Māori, tikanga and kaitiakitanga; environmental marine management, decision-making and governance; policymaking, relationships, consultation and resource planning processes, over a period of seven years.

## Findings

In 2013, the mussel bed boundaries in the western side of Ōhiwa Harbour had changed dramatically, with a significant eighty-eight percent (88%) of the original 2007 bed boundaries identified as no longer present. In 2007 the mussel bed boundaries covered an area of one hundred and ninety-four thousand square metres (194,000 sq.m). The 2007 bed boundaries measured one thousand, eight hundred and forty metres (1840m) in length and one hundred and seventy-one metres (171m) in width at its widest point. In 2013 the mussel bed boundaries covered an area of twenty-three thousand (23,000 sq.m) and measured three hundred and nineteen metres (319m) in length and one hundred and one metres (101m) in width at its widest point.

The seastar bed boundaries of 2009 were identified as covering an area of thirty-five thousand, eight hundred and seventy-two square metres (35,872 sq.m). In 2013 the defined seastar bed

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3 Yuppo is specialised paper that enable a person to be able to write while under the water.

boundaries were no longer present, with seastars disseminated throughout the 2013 mussel bed boundaries.

Samples collected in 2013 identified a significant rapidly decreasing population of *Perna canaliculus* - Green lipped mussels in the western side of Ōhiwa harbour. A dramatic ninety-eight percent (98%) of the original mussel population were no longer present. In 2007 an estimated one hundred and fifteen million (115) mussels were present. In 2009 an estimated sixteen million (16) million mussels were present, in 2013 the mussel population had significantly decreased to an estimated two (2) million.

In 2013 most of the mussels sampled were identified in the smallest juvenile size class one (0-20mm) width, this was consistent with the findings of 2007. Sizing growth trends from previous monitoring studies of 2007, 2008, and 2009 suggest that the 2013 cohort of new juvenile recruit mussels may be the beginning phase of a new three-year cohort cycle.

In 2009, it was found that most sampled mussels were identified in the adult, harvestable size class three (41-60mm). In 2009, it was also found that the majority of sampled seastars also measured in the larger size classes of four (31-40cm) and five (41-50cm). In 2013, most mussels sampled were identified as juveniles, size class one (0-20mm). This was consistent with seastar measurements which identified a significant majority of all sampled seastars as measuring in the smaller juvenile size class two (11-20cm). A moderate relationship between the mussels and seastars was evident, suggesting that seastars sizing may increase at a rate similar to mussel sizing.

In 2009 the seastar population was estimated at one point two million (1.2 million) with a biomass (wet weight) of six hundred and seventy-two (672) tons, of which the majority measured in the larger, adult size classes. In 2013 there were an estimated ninety-nine thousand (99,000) seastars present with a biomass of five (5) tons, of which the majority measured in the smaller, juvenile size classes. In 2013, ninety-two percent (92%) of the seastar population were no longer present. It was also observed that an estimated forty-four thousand (44,000) cushion stars were also present in the mussel bed boundaries in the western side of Ōhiwa harbour.

A significant presence of *Paphies australis* (pipi) were heavily distributed within an area that was previously populated by mussels (Paul-Burke, 2007, 2008, 2009). The pipi population were observed alongside the new 2013 mussel bed boundary and measured between 0-1cm in length, stacked six high and numbered in the many millions. The pipi bed was an estimated two hundred (200) metres in length and forty (40) metres in width. Many juvenile (size class one) mussel clusters were surrounded and appeared to be overwhelmed by the encroaching pipi population. High numbers and large areas of dead shell mussel debris were observed on the bottom substrate of the new mussel bed boundaries. Large numbers of juvenile mussels were attached to the dead shell debris rather than the harbour floor. Juvenile clusters attached to dead shell debris were observed being swept away by the currents. Outside of the identified mussel bed boundaries, five small groupings of no more than ten juvenile mussels per group were observed attached to dead shell debris in the eastern band of the now devastated, original Site 1 bed area of 2007.

Based on these research findings the Mussel Management Action Plan (MMAP) for Ōhiwa harbour - translating kaitiakitanga into strategic political action by Māori - was developed. The MMAP was designed as a cohesive whole harbour approach to the wise use, care and sustainable management of the green-lipped mussel populations in Ōhiwa harbour. It would assist Māori decision-making for the effective management of taonga mussel populations in the harbour. The MMAP was developed in consultation with the relevant Māori authorities. It sought to identify

pertinent information that would assist decision-makers in the management of green-lipped mussel populations in Ōhiwa harbour.

The information being sought included marine ecology and ecosystem functioning of mussel and seastars. Mātauranga Māori or more specifically, traditional ecological knowledge of mussel distribution boundaries in the harbour was considered fundamental to the MMAP. The MMAP sought to shift the focus of effort for mussel populations from the confines of the western side to all areas of the harbour, namely the western and eastern sides. The MMAP was presented as three option phases and was identified as a medium-term plan of three years.

The timeframe of the MMAP is consistent with the three-year term of elected government members. The timeframe was approved by the relevant Māori authorities as a 'good place to start.' It was hypothesized that the timeframe would promote instant action and position government members to be able to commit to the life of the plan.

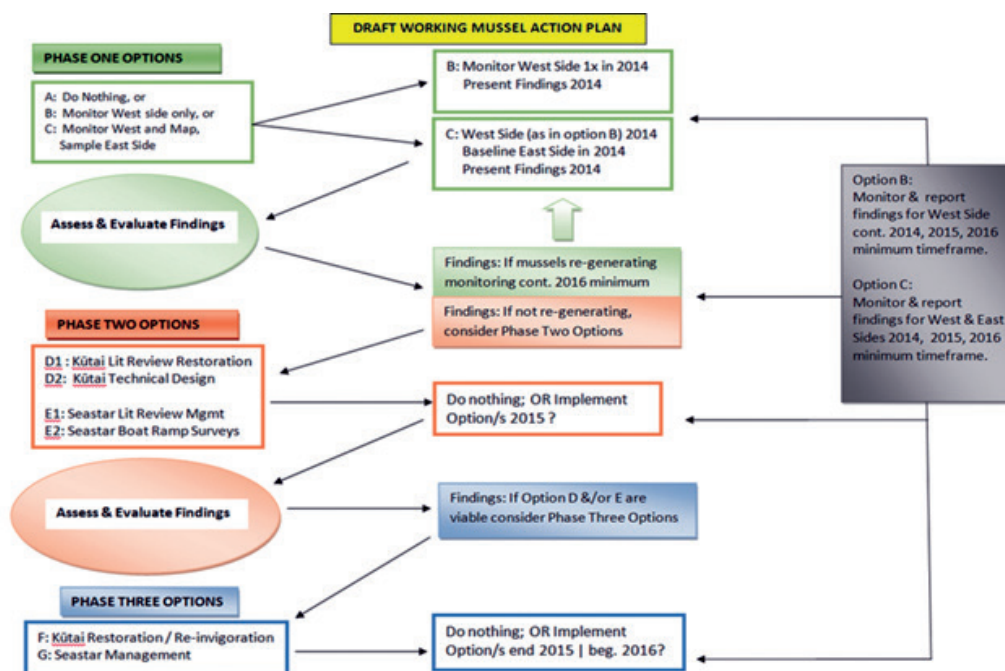
Phase One of the MMAP sought to establish a monitoring regime for mussel populations in the harbour. This was to be achieved by conducting a baseline survey of mussel populations in the eastern side of the harbour, which would then enable the establishment of a monitoring regime of all mussel populations in all areas of the harbour.

To achieve this, Phase One of the MMAP offered three options for the decision-makers. The first option was to do nothing. The second option was to establish a monitoring programme for the western side of the harbour only. The third option was to monitor the western side of the harbour and at the same time establish new baseline research survey action in the eastern side of the harbour. If the results of sampling efforts in the western side of the harbour identified a reinvigorated population of mussels, the decision-makers could decide to either proceed to Phase Two or stay with a three-year monitoring cycle of mussel populations in all areas of the harbour (black box in MMAP, Fig 1). This option allowed for flexibility and consideration of unforeseen circumstances such as resourcing limitations, government re-structuring and ecological change.

Phase Two options of the MMAP sought to generate information about how best to restore or rejuvenate mussel populations in temperate estuarine environments. Phase Two options also sought to ascertain specific knowledge regarding the best practice management options and rates of success outcomes for seastars in estuarine environments both nationally and internationally.



## A COLLECTION OF READINGS FROM GRADUATE STUDENT THESES



Phase Two options were designed as a flow-on from Phase One. If the mussel populations were not rejuvenating then the following options were available for the decision-makers consideration.

Phase Two option D1 sought to establish information gathering in the form of a literature review of restoration efforts of mussel populations in the wild. The literature review was also positioned to ascertain restoration efforts of other large bivalve species in temperate estuarine environments, nationally and internationally. Option D2 required information gathering of potential in-water apparatus that may or may not assist in restoring mussel populations in the Ōhiwa harbour.

Like D1, option E1 sought to access information on best practice management strategies of seastar populations, the rates of success and limiting factors, nationally and internationally.

Option E2 required boat ramp surveys be conducted with recreational fishers and the types of fish they were catching from the harbour. The surveys were to target fisher-people on boats and also those that were fishing from the shore or wharves. The intention of the surveys was to understand if pelagic predators of seastars were being over-harvested by recreational and customary fisher-people.

Phase Three options were positioned to action relevant information garnered from the Phase two literature reviews, technical in-water apparatus designs and boat ramp surveys. Phase Three provided the decision-makers with considerations for evidence-based, pro-active strategies for the restoration of green-lipped mussel populations, along with best practice management of seastar populations in the mussel bed boundaries of Ōhiwa harbour.

The mussel management action plan was presented to the partnering members of the OHIF on 3rd March 2014. Māori and government partners unanimously accepted the plan. The OHIF forum members considered the recommendations for further research were crucial to address the issues and gain better understandings of the harbour's biodiversity.

The accepted recommendations included:

- Requests that the Ōhiwa Harbour Strategy Coordination Group (OHSCG) implement an assessment of the western side of the harbour, establishes a consistent and sustained monitoring programme to identify the cyclic patterns of mussel and seastar populations.
- Requests an assessment of the eastern side of the harbour to identify traditional and current mussel distribution areas, maps the bed boundaries and samples mussel populations consistent with the western side following which a monitoring programme is established.
- Requests a review be undertaken to determine best practice seastar management and rates of success in other locations (nationally and internationally).
- Request Ōhiwa Harbour Strategy Coordination Group to raise with their organisation the opportunity for funding to prioritise mussel and seastar research.

## Conclusion

Estuaries, such as Ōhiwa harbour, by their very nature, are places of extraordinary (both predictable and unpredictable) natural change in both time and space, and across very broad scales. They are dynamic, resilient and remarkably diverse (Bortone, 2005). Estuaries are more “complex morphologically, topographically, oceanographically and biologically than waters further offshore” (Roff & Zacharias, 2011, p.42). They are also one of the most degraded ecosystems on the planet (Kaiser et al, 2011; Ray & McCormick-Ray, 2003).

Community support for the protection and ‘well-being’ of the mussel populations is strong as evidenced by the research. Public and community feedback to BOPRC, identified management of all mussel populations in all areas of the harbour, as the number one priority action, in the regional government planning document “The Ōhiwa Harbour Strategy Refreshed 2014”.

However, there is a gap in government legislative responsibilities of customary taonga marine species and ecosystems. No government agency is accountable for the sustainable management of customary taonga species in Ōhiwa harbour. There is no funding support, commitment or responsibility held by any one governmental agency. There is an assumption that all affirmative efforts to protect and sustain customary marine taonga species must be actioned by Māori, including the financial burden.

Current management practices for customary taonga mussel populations in the Ōhiwa harbour are conducted in a fragmented and ad hoc manner. There are barriers for the abilities of Māori to access and participate in decision-making forums and/or retrieve governmental support and funding for the sustainable future of customary taonga marine species (Brake & Peart, 2013).

Managing marine environments and ecosystems is uncertain and confusing. It is understood that we make decisions for marine ecosystems and customary taonga species in the face of great uncertainty. There remain significant issues over the handling of uncertainty between different disciplines, cultures, communities and professions. Issues of how to address and administer affirmative, sustainable policy and management decisions are conflicting, contested and unresolved (Dovers & Hussey, 2013).

Central government needs to provide leadership to advance Aotearoa New Zealand’s marine management attitudes and practices to our marine spaces and management regimes.

*We need a few things to change. First, we need unity around a common cause. Public, private and*

*civil society sectors need to pull together in a bold and coordinated effort. Second, we need leadership for change. Sitting on a bench waiting for someone else to make the first move doesn't work. Heads of state need to start thinking globally; businesses and consumers need to stop behaving as if we live in a limitless world (World Wildlife Foundation International, 2014, p.5).*

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## Glossary

Aotearoa	New Zealand
Awanuiārangi	Eponymous ancestor of Ngāti Awa
Hapū	Subtribe
Iwi	Tribe
Kaitiaki	Guardian
Kaitiakitanga	Active guardianship
Kanohi kitea	The seen face
Kaumātua/kuia	Male and female tribal elders
Kaupapa Māori	Research approach
Kawa	Protocols
Kotahitanga	Working or coming together
Kūtai	Green-lipped mussel
Manaakitanga	Nurture and care for others
Mana	Prestige, authority, control, power, influence, status
Māori	The indigenous people of Aotearoa
Mātauranga Māori	Traditional knowledge
Mauri	Life-force
Pūkenga	Expert
Rāhui	Temporary Closure restricting harvesting Rangatiratanga Sovereignty, right to exercise authority
Taonga	Treasure
Tikanga	Correct procedure, custom
Titiro	Look or observe very carefully
Whakarongo	Listen
Whakawhanaungatanga	Relationships, kinship, sense of connection

*Te Rangahau Taiao  
ki Awanuiārangi*

## CHAPTER 3

# AN EVALUATION OF CUSTOMARY FISHERIES MANAGEMENT IN TAURANGA, NZ.

*Ellis, K.K.*



Ko Mataatua tōku waka  
Ko Mauao tōku maunga  
Ko Tauranga tōku moana  
Ko Ngāi Te Rangi tōku iwi  
Ko Ngāi Tūkairangi, Ngāti Tapu tōku hapū  
Nō Matapihi ahau  
Ko **KIA MĀIA ELLIS** ahau

Taku mahi, ko te Kaiarahi Taiao o Te Rūnanga o Ngāi Te Rangi Resource Management Unit.

Nō reira, tēnā koutou, tēnā koutou, tēnā katoa

**Background:** Kia Māia has a marine and mātauranga Māori background, with a particular focus on customary fisheries. Her current work for iwi and hapū envelopes a wider emphasis on the Māori worldview of Te Ao Tūroa, the environment. Through her work she provides the support to tangata whenua in the application of traditional environmental management in the fast-developing region of Tauranga Moana. This enhances the future potential for the development of Māori partnership frameworks that are recognised and applied to environmental policy. As a PhD candidate at Te Whare Wānanga o Awanuiārangī, she endeavours to provide answers to the development of Co-Governance and Co-Management pre, and post, Treaty settlement for tangata whenua.

**Qualifications:** Diploma in Marine Studies, Bachelor of Applied Science, Master of Māori Studies (Hons)



## Abstract

*“It is about kaitiakitanga, he taonga tērā. It has been handed down from koroua, to father, to son, to mokopuna and those yet to be born. It is a learning system.”*

The management of customary fisheries is under resourced in New Zealand. As such it struggles to cope with sustainability issues that arise, particularly in developed areas. Tauranga Moana Iwi expressed the need to improve upon their customary fisheries management framework. Therefore, this research assisted Māori in customary fisheries management. The impact of its results enhanced customary fisheries management on a local level for Tauranga Moana which then informed customary fisheries authorities and managers nationally.

Customary harvesting was surveyed to assess fishing trends. This assisted with an evaluation of how effective the Efish customary fishing database was. Results showed that administrative systems needed to improve and the database could only be useful to Tangata Kaitiaki once they were committed to utilising it as a planning tool. Potential shellfish enhancement in Tauranga was assessed. This provided options to increase suitable habitat for reef species and reseeded of some shellfish species. Sourcing resources for these options would need to be carefully planned, based on partnerships with other agencies. An amended management model was presented for more practical management and planning. It was deemed necessary to strengthen alliances with other agencies better equipped to carry out more technical and costly tasks which would help the Trust achieve long term fisheries sustainability.

Unfortunately, during the progression of this research, a container ship struck the Astrolabe Reef - Ōtāiti, which lies 25km north east of the Tauranga mainland. Within a week, hundreds of tonnes of oil, then container waste had surged onto the shores of Maketū, Pāpāmoa, Mount Maunganui and Matakana Island. Tangata Whenua considered the long-term impacts of this event to be largely unknown. This led to several new research projects focused on both the recovery of the marine environment and a greater understanding of our fisheries.

## Introduction

This evaluative research study was based on six years of working alongside the Tauranga Moana Iwi Customary Fisheries Trust. The purpose was to evaluate current customary fisheries management practice in Tauranga, to improve upon the current customary fisheries management framework in Tauranga.

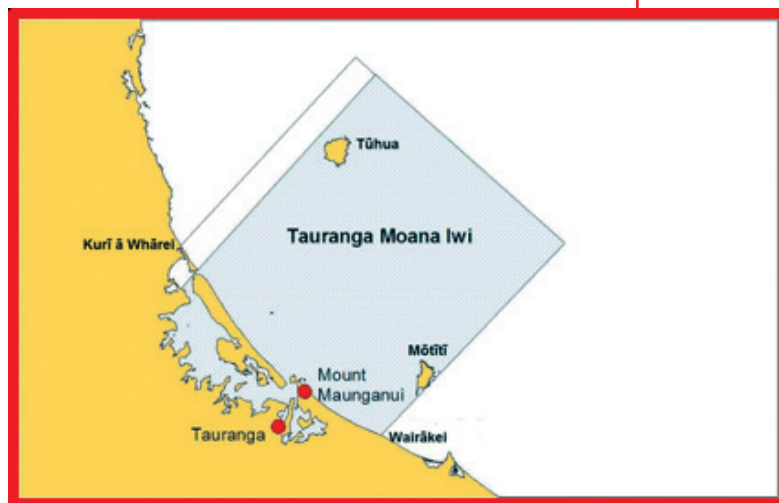
Tangata Whenua define the Tauranga Moana customary fisheries area as ‘*Mai i Ngā Kurī ā-Whārei ki Wairākei*’. This reaches from the stream named Kurī ā-Whārei at the northern end of the harbour to the stream named Wairākei at the southern end. It also encompasses the inner Tauranga Harbour and two offshore islands named Tūhua in the north and Mōtītī in the South (Figure 1).

The harbour environment of Tauranga is an estuarine area covering approximately 200km<sup>2</sup>. Matakana Island forms a protective barrier to the Pacific Ocean stretching from the northern entrance at Kura ā-Māia to the Mauao entrance at the southern end - Mount Maunganui (Figure 1). A diversity of fish life enters the harbour to feed on shellfish and other wetland organisms.

Mōtītī is an offshore island located nine kilometres from the Bay of Plenty coastline. The island is approximately 7.2 km<sup>2</sup> in area and home to a resident population of 33 people at the time of the 2001 census. Mōtītī has two distinct areas. The northern half of the island is held in Māori land ownership and the southern half is in general title (Department of Internal Affairs, 2006).

## TE RANGAHAU TAIAO KI AWANUIĀRANGI

Tūhua is the visible portion of a 15km wide shield volcano. It is approximately 35 km north of the Tauranga Harbour entrance and 26 km off the mainland coast. Tūhua is Māori owned land administered by the Tūhua Trust Board for Te Whānau ā-Tauwhao. In 1993 a Marine Reserve was established on the northern side of the island, created in partnership between the Tūhua Trust Board and the Ministry of Fisheries (Department of Internal Affairs, 2006).



*Map of study area and gazetted Rohe Moana*

### Tauranga moana iwi customary fisheries trust

The realm of Tangaroa has always held a significant customary value to Māori. The sea is not only a source of food it encompasses a magnificent traditional history and forms a part of Māori identity. The progressive impacts on fisheries in the region led Tauranga Moana Iwi to work together on dealing with customary fisheries issues. A holistic approach to managing the environment encompasses the guiding values of their ancestors.

These are outlined in the Rohe Moana Management Plan (RMMP) (Tauranga Moana Iwi Customary Fisheries Trust, 2012) as follows:

**Kaitiakitanga:** *Guardianship of resources, preferring and promoting best practices, pursuing quality and ensuring sustainability as stewards of the moana and all its life forms.*

**Orangatanga:** *The welfare and sustenance of all living things be maintained at a level that is consistent with sustainability.*

**Wairuatanga:** *The spiritual world is an important part of reality which must be accommodated on a day to day basis, even when it conflicts with the 'rules' of business or institutional behaviour.*

**Mauri:** *Have regard for sustaining the life force of the moana as an element that permeates through all living things.*

**Aroha:** *Show care, love and respect for ngā tangata and the moana and all its life forms.*

**Mātauranga:** *Express and impart the knowledge of our ancestors and the traditions that have transcended down alongside knowledge gained from the modern world.*

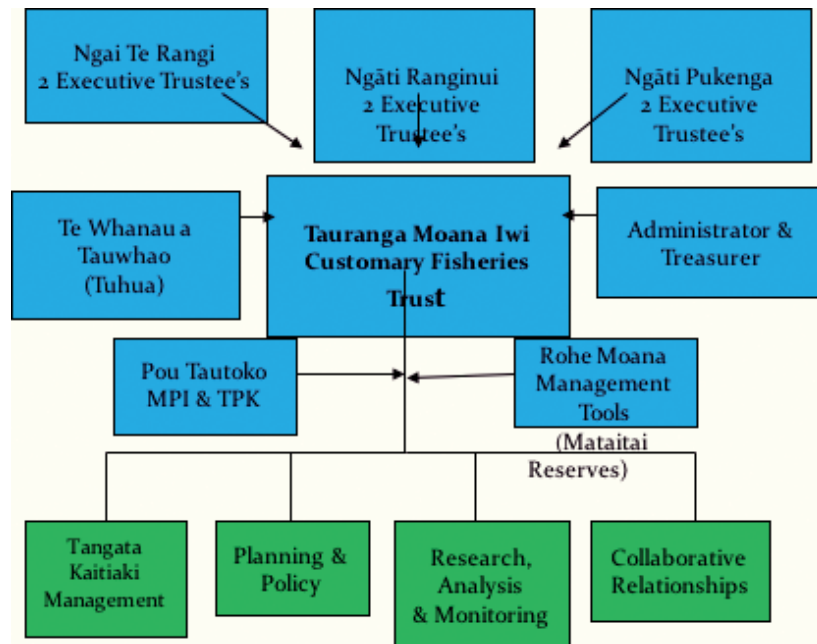
**Āwhina:** *Give assistance and care to help others to ensure that safety and health are not compromised.*

**Mahi tahi:** *The value of cooperation, we will work together to share knowledge, accept advice and utilise the collective skills of others willing to assist to produce better outcomes.*

Tauranga Moana Iwi endeavour to improve the sustainability of the fishery for the whānau, hapū and iwi of the rohe and ensure that traditional roles towards the moana are strengthened and maintained.

As a result, Tauranga Moana Iwi Customary Fisheries Committee was created and mandated with the support of Tauranga Moana hapū in 2002. It was a joint initiative of the three Iwi; Ngāi Te Rangi, Ngāti Ranginui and Ngāti Pūkenga. It provides practical support to the hapū of Tauranga Moana; promoting and protecting their customary rights under Article II of the Treaty of Waitangi (TMICFC Strategic Plan, 2007-2009).

Each associated Iwi has the right to appoint two representatives with the six members comprising the executive trustees (Figure 2). In 2009 the Committee was reformed into a Charitable Trust. This group is now recognised as the Tauranga Moana Iwi Customary Fisheries Trust (Trust). The Trust manages customary fisheries by promoting and utilising kaitiakitanga traditions.



*Executive framework of Tauranga Moana Iwi Customary Fisheries Trust*

There are four operational units identified with strategic outputs in the Trust's Operational Plan. The Rohe Moana and Mātaaitai Reserve are of focus by all four management sectors of the Trust. Any management tools applied in the region are important to all aspects of the Trust's work.

The Tangata Kaitiaki Management sector (Figure 2) is responsible for all gazetted Tangata Kaitiaki. This includes customary catch reporting, induction training, regular up-skilling, compliance issues and management planning. Planning and Policy is focused on the four strategic output areas; Tangata Kaitiaki Management, Planning and Policy, Research Analysis and Monitoring and Collaborative Relationships. The Operational Plan is reviewed and updated each year to include any new tasks required in the upcoming year.

The Tauranga Moana Iwi Customary Fisheries Trust is a sub-regional group of the larger regional forum which comprises ten Iwi of the Bay of Plenty. This forum deals with customary fisheries management on a regional level. It provides input into national planning of the Ministry for Primary Industries.

The ability for Regional Māori fisheries forums to have input into national planning for fisheries was a key improvement to the Treaty partnership between Māori and the Crown. This is catered for through the development of Iwi Forum Fisheries Plans. This applies to all regional customary fisheries forums in the country that work collaboratively with the Ministry for Primary Industries under the customary regulations.

Customary Marine Tenure (CMT) refers to customary management of local marine resources as a global term. 'Customary' refers to a system emerging from traditional roots and constitutes part of what is often termed 'customary lore'. It has continuous links to local history and adapts to changing contemporary circumstances; 'Marine' refers to the environment dealing with reefs, lagoon, coast and open sea including islands and islets contained in this overall sea space (Ruddle, Hviding & Johannes, 1992).

Tauranga Moana Iwi chose to apply customary regulations due to the variety of impacts on the fishery. Impacts were caused not only from customary and recreational over-harvesting, but also industrial, horticultural and residential development. The ability to extend upon the rules of fishing provided more opportunity to enhance sustainability of kai moana in the region.

Utilising the customary regulations and working alongside the government may not work for all Iwi. Some prefer to continue without the intervention of government and the implementation of fisheries management tools. For isolated areas with low residential population it may not be necessary to apply further fisheries management tools.

Other customary fisheries management researchers agree that it should not be assumed that CMT systems in the Pacific Basin are effective fisheries management systems in every instance. However, traditional inshore fisheries management can potentially play a major role by ensuring equal access to fisheries. It can also assist with managing and enforcing conservation measures to ensure the sustainability of coastal fisheries (Ruddle, Hviding & Johannes, 1992).

Indeed, customary fisheries management is viewed by the government as cost effective due to the fewer social, political, legal, conservation related, management cost problems that must be addressed. Customary fisheries management systems institutionalise equality of access and conflict avoidance or resolution. They are adapted temporarily to the fluctuating availability of the resource and so contribute to local stability (Ruddle, Hviding & Johannes, 1992).

Tauranga is an environment where population growth and development is constant. It is therefore deemed necessary that the government supports traditional customary fisheries managers. However, it is important for Māori to find the balance between Western and Māori environmental management techniques. Retaining Māori principles and values within this process is important. Clear understanding of the boundaries between Western and Māori techniques is important in achieving sustainability goals without obstructing traditional values.

### Fisheries regulations

In September 1992, the Crown and representatives of Māori entered into an agreement to settle outstanding claims and Treaty grievances in relation to fisheries. This was the 1992 Deed of Settlement. It aimed to compensate Māori claims to commercial fishing and clarified Māori rights to customary or non-commercial fishing (Tauranga Moana Iwi Customary Fisheries Trust, 2012).

In late 1992, the Treaty of Waitangi (Fisheries Claims) Settlement Act became law giving effect to the Deed of Settlement. Under the Settlement Act, Māori claims to commercial fishing rights were settled by the government. This resulted in Māori investment in Sealord Products LTD, which owns about 25% of all fishing quota. Māori are also entitled to 20% of quota for any new species brought under the Quota Management System (QMS).

This Act affirms the rights of Tangata Whenua to participate in the management of the fisheries of New Zealand. The Act also provides that there must be particular regard for kaitiakitanga (Tauranga Moana Iwi Customary Fisheries Trust, 2012).

With the settlement of Māori commercial fishing claims, the way was clear to develop the QMS further. This allowed the passage of the Fisheries Act 1996. However, there was still an obligation for the Crown to consult with Tangata Whenua. The Crown developed policies to help recognise the customary use and management practices of Māori for non-commercial fishing (Tauranga Moana Iwi Customary Fisheries Trust, 2012).



The Fisheries Act 1996 activated regulations to define how customary fishing could take place. The rights and responsibilities of Tangata Whenua in managing their customary Māori fisheries were defined. This provided greater opportunity for Māori to be involved in many aspects of sustainable fisheries management (Tauranga Moana Iwi Customary Fisheries Trust, 2012).

The Fisheries Act provides for increased input by Tangata Whenua in managing local, non-commercial fisheries in fishing areas that have traditional significance to Iwi or Hapū. This is applied through the Fisheries (Kaimoana Customary Fishing) Regulations 1998. This will also be referred to as the customary regulations. The customary regulations were introduced via the 1992 Settlement Act. It outlined processes for the establishment of Rohe Moana, appointment of Tangata Kaitiaki, Mātaitai Reserves and the Taiāpure provisions introduced in 1989 (Tauranga Moana Iwi Customary Fisheries Trust, 2012).

Other specific circumstances in support of customary practices are also covered by the regulations. For example, Te Marutūahu rāhui was established under S186A Temporary Closure on the harvesting of kuku (green lipped mussels) to enable the fishery to recover.

### Customary regulations

Customary regulations are important for ensuring that fisheries are available for future generations. This utilises the fishery to sustain cultural practices, takes steps towards partnership with Tangata Whenua and prevents abuse of natural resources (Ministry of Fisheries, 2009).

In Tauranga Moana, Tangata Kaitiaki utilise two sets of fisheries regulations. These are Regulation 27A and the Fisheries (Kaimoana Customary Fishing) Regulations 1998. A portion of the rohe moana remains under Regulation 27A due to opposition by neighbouring Iwi in relation to overlapping rohe interests.

The Fisheries (Kaimoana Customary Fishing) Regulations 1998 is a much clearer process and provides for the making of comprehensive customary fishing regulations. The Fisheries (Kaimoana Customary Fishing) Regulations 1998 apply to the area declared and gazetted as rohe moana. The regulations provide for *'Iwi and Hapū to manage their customary fishing'* in a way that *'best fits their traditional practices'*. Tangata Kaitiaki can follow their tikanga in the way that customary harvesting is authorised. In October 2004, Tauranga Moana Iwi declared their rohe moana (shown in Figure 2).

These regulations provide for local management of customary non-commercial fisheries in the areas where Iwi have *'mana whenua and mana moana'*. This includes establishment of Mātaitai Reserves, Taiāpure and the right for Tangata Kaitiaki to authorise the taking of kai moana for customary purposes. This regulation does not remove the right of Tangata Whenua to catch their recreational limits under the Amateur Fishing Regulations.

The Tauranga Moana Iwi Customary Fisheries Trust has put a lot of effort into strengthening the mana and rangatiratanga of Tauranga Moana Whānau, Hapū and Iwi. There are two main features that describe whakapapa as a binding force for the three Iwi of Tauranga Moana, Ngāi Te Rangi, Ngāti Ranginui and Ngāti Pūkenga. The first is related to the cultural belief that Māori are the descendants of the Atua. They were the first kaitiaki of each of the domains of the natural world. The second relates to the descent from different waka (Ngāti Ranginui from Takitimu and Ngāi Te Rangi and Ngāti Pūkenga from Mātaatua). The three Iwi acknowledge that intermarriage has bound them together (Fisher, 1997).

Tauranga Moana Iwi acknowledge that through this whakapapa there are inherent responsibilities

which follow including kaitiakitanga; the act of guardianship. This establishes the fundamental foundation for establishing the customary relationship that Ngāi Te Rangi, Ngāti Ranginui and Ngāti Pūkenga have with the moana. Kaitiakitanga is exercised by the three Iwi on behalf of Te Whānau ā-Ranginui rāua ko Papatūānuku (Fisher, 1997).

Kaitiakitanga takes place in the natural world within the domain of ngā atua. It is practiced through (a) the maintenance of wāhi tapu, wāhi tūpuna and other sites of importance, (b) The management of fishing grounds, mahinga Mātaitai, (c) Protests against environmental degradation, (d) Observing maramataka - lunar calendar, and (e) Good resource management (Te Puni Kōkiri, 1993). From a traditional perspective, kaitiakitanga cannot and should not be practiced without incorporating the spiritual elements of its application. Principles such as whakapapa, tapu, tikanga, kawa, mauri, rangatiratanga, mana and manaakitanga should be recognised when describing kaitiakitanga.

### Incorporation of kaitiakitanga in legislation

Before the concept of kaitiakitanga was introduced to resource management planning and policy in New Zealand, the country had already undergone a systematic process of colonisation. It effectively replaced Māori knowledge with Christian beliefs within the education system and sought to eliminate the Māori language and destroy Māori knowledge and belief systems. The process of colonisation assisted with traditional forms of knowledge and the practice of kaitiakitanga to be obsolete within the community. Passing of the Resource Management Act 1991 (RMA), made the process of re-interpretation of kaitiakitanga easy for the government.

The RMA has wide ranging powers that presents the context in which to promote ideas in management such as sustainable management. It includes reference to the Treaty of Waitangi and Māori notions of environmental management such as kaitiakitanga (Te Puni Kōkiri, 1993). All persons exercising powers under the Act have a mandatory obligation to make provision for Māori cultural values. This is in all aspects of resource management when preparing regional and district plans. However, the intention of the RMA in its definitions and the matters of national importance are ambiguous and therefore open to interpretation.

Māori have endured the systematic process of colonisation and are still recovering from the impacts upon generations before us. Through a better education system and better representation of Māori customs and values in the future, the term kaitiakitanga will continue to evolve. Perhaps kaitiakitanga will again reach the potential of its purpose *'to sustain all the natural resources for the benefit of generations to come'*.

### Methodology

The overall objectives of this evaluative research were to assess current customary fisheries management practice in Tauranga, and to improve upon the current customary fisheries management framework in Tauranga.

Four areas were explored including:

1. Kaitiakitanga Management
2. EFish Online Customary Fishing Database
3. Kai Moana Harvest Trends
4. Enhancement Potential in Tauranga Moana

This research used a Māori Centred Research Methodology to ensure '*participant driven research*'. The participants were members of the Tauranga Moana Iwi Customary Fisheries Trust and Tangata Kaitiaki that issued permits for customary harvesting in Tauranga Moana. The Trust steered the project towards outcomes that they wished to achieve for fisheries management in Tauranga.

To ensure that ethical boundaries were not compromised the Trust was set up as the supervisory and governance committee. The methodology and associated methods were prepared in conjunction with the Trust. This assisted with choosing the best ways to complete the research and discuss methods that the participants would be comfortable with.

It provided a forum to discuss any issues around cultural sensitivity that could have arisen. Regular updates and recommendations were discussed with the governing committee as the research progressed. A matrix of different approaches was applied that best enabled the research objectives to be completed as follows:

### Survey of customary fishing data

Customary harvesting data between 2007 and 2011 was retrieved from reports of the customary fishing authorisation 'permit' books that were entered on to the customary fishing database. An analysis of how effective the Efish Customary Fishing database (Efish) was carried out during this process to ascertain whether the system and the process around the Tangata Kaitiaki using the system were running efficiently. Spreadsheets were collated from hard copies of the customary fishing authorisations (permits). Any trends that appeared during analysis of the customary harvesting data influenced the shaping of some of the questions generated for interviews with Tangata Kaitiaki. Interviews provided some of the answers to questions relating to fishing trends during the five-year study timeframe.

Analysis of survey of customary fishing data

Spreadsheets were analysed as follows:

The number of permits that had been issued by all Tangata Kaitiaki within the rohe moana

The number of permits that were issued for functions on Tauranga Moana marae.

The purposes that permits had been issued for

The trends that appeared for customary harvesting of individual species.

### Interviews and focus groups

Qualitative information was obtained from Tangata Kaitiaki. An information sheet and interview questionnaire were provided to participants prior to carrying out any interviews. Due to participants preferring the discussion 'hui' method only three formal interviews were undertaken. Interviews were recorded and later transcribed. Interview topics were based on kaitiakitanga; the collaborative relationship with the Ministry of Primary Industries; managing Tangata Kaitiaki; the Efish customary fishing database; issuing permits; and trends that appeared during the analysis of customary fishing data. Most information was gathered during the monthly meetings held by the Trust. Other narratives recorded within the minutes of Trust meetings also informed outcomes of this research.

## Desktop review

To investigate the viability of enhancement measures for selected kai moana species a desktop review looking at enhancement measures with potential to increase sustainability of the main harvesting areas in Tauranga was conducted. Aquaculture and habitat restoration were key areas of interest. This was to provide initial recommendations to the Trust on kai moana enhancement potential. Options reviewed were based on projects that would best suit the existing habitat areas in Tauranga for selected kai moana species.

## Findings - kaitiakitanga management

The Trust has an appointed member to oversee the management of all Tangata Kaitiaki. This is a role within the Trust to ensure that Tangata Kaitiaki carry out their responsibilities towards kaitiakitanga and to their whānau, hapū and marae. The role is imperative to ensuring that copies of permits are returned for management purposes and quarterly reporting to the Ministry for Primary Industries.

The Trust had 44 gazetted Tangata Kaitiaki on record affiliated to 26 marae in Tauranga Moana. The Trust is responsible for ensuring that Tangata Kaitiaki are aware of the health and status of the fishery. It is also a requirement to provide quarterly catch reports to the Ministry for Primary Industries. To keep this information as accurate as possible, the Trust began visiting Tangata Kaitiaki to physically collect their permits. This was a time consuming and cost ineffective method for meeting reporting requirements. It also did not ensure that all permit information had been received, as some Tangata Kaitiaki were unreachable.

Each year, the Trust provides the opportunity for Tangata Kaitiaki to attend the Annual General Meeting (AGM) and a training workshop. This enables Tangata Kaitiaki to keep abreast of the responsibilities of their role, learn how to use the customary fishing database and discuss any concerns. Attendance to the AGM and training workshops has become an important aspect of communication and management for the Trust.

The commitment to kaitiakitanga that the Trust endeavours to achieve requires long term planning and active research. As such the Rohe Moana Management Plan (RMMP) was developed; a resource that assists with achieving part of that commitment to kaitiakitanga. This is a unique plan suiting the needs of Tauranga Moana with an overall goal to achieve a sustainable fishery.

The RMMP contains background information about how the rohe moana and Tangata Kaitiaki were established. It describes the mandated role of the Trust under the customary regulations and the roles and responsibilities of the Tangata Kaitiaki (Tauranga Moana Iwi Customary Fisheries Trust, 2012).

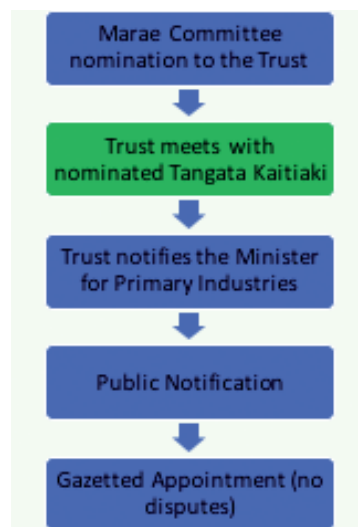
The RMMP also includes a guide to writing permits and a Catch Policy section making this management plan unique to local fisheries management and planning in Tauranga. A Taonga species list was created to be used as a guide for Tangata Kaitiaki to consider when issuing permits for areas outside their immediate marae area.

Upon appointment of new Tangata Kaitiaki the RMMP needs to be provided as a resource. The Trust is obligated to ensure that responsibilities within the plan are being carried out. Management of Tangata Kaitiaki is overseen by one of the Trust members. This role includes ensuring that Tangata Kaitiaki are issuing permits in a sustainable manner and providing catch reports to the Ministry.

The Trust was concerned that a majority of Tangata Kaitiaki were failing to provide catch reports. This was simply returning copies of customary fishing permits or advising the Trust if there were none. This issue meant that catch reporting sent to the Ministry was incomplete. Incomplete catch return information could not be used to determine fisheries management decisions. The opportunity to implement some of the recommendations to assist with renewing the RMMP for the Trust were presented to Tangata Kaitiaki during the AGM in March 2012 and was a key driver to initiate some improvements formally. It also provided the opportunity to discuss and provide Tangata Kaitiaki with information to enact new procedures and policies. Recommendations included introducing a new process for appointing Tangata Kaitiaki and reducing the number of gazetted Tangata Kaitiaki.

### Amended process

The Tangata Kaitiaki appointment process required changes to ensure that consistency of the regulations and guidelines were applied. An additional step in this process was applied (Figure 3). Meeting with nominated Tangata Kaitiaki and relative marae prior to the appointment was added to ensure that the role and responsibilities were clear and agreed from the outset. It also provides the opportunity to discuss the importance of filling in permits correctly and why from the perspective of the Trust. The additional step will reduce time spent on correcting mistakes that Tangata Kaitiaki are unaware of until they occur.



*Recommended model for appointing Tangata Kaitiaki.*

The marae and the Trust now have a shared responsibility in the appointment of any new Tangata Kaitiaki. This strengthens the relationship between the Trust, the marae and the Tangata Kaitiaki.

### Reducing the number of gazetted Tangata Kaitiaki

The Trust was aware of the need to make changes to the existing group of Tangata Kaitiaki. Options explored showed a clear preference to reduce the number of gazetted Tangata Kaitiaki. The existing Tangata Kaitiaki were a large group spread throughout Tauranga Moana. This



proved difficult to manage. In 2010, less than 50% of existing Tangata Kaitiaki issued permits. This presented a logical decision for the Trust to review reasons why Tangata Kaitiaki were no longer issuing permits and remove those that continued to be inactive.

The following options are being reviewed by Trust members; 1) Remove inactive Tangata Kaitiaki; 2) Reduce Tangata Kaitiaki to one per marae instead of two; 3) Remove those Tangata Kaitiaki that are not complying with the customary regulations and the RMMP and recruit others as required; 4) Apply 'cluster groups' of Tangata Kaitiaki.

Operating with consistency and transparency is an ideal way to go through this process. It was advised that representatives of marae were included in this process to enable open communication. Customary fisheries management and fisheries sustainability requires a closer working relationship between the Trust, the marae and the Tangata Kaitiaki.

### Efish online customary fishing database

Efish was developed for Tangata Kaitiaki to use for quarterly catch reporting purposes to assist fisheries management decisions. It enables Tangata Kaitiaki to enter all customary fishing authorisations (permits) onto an online database. Its purpose was to reduce the time and administrative resources required by the Trust for reporting and administration. Quarterly catch reporting to the Ministry for Primary Industries (MPI) is obligatory under the customary regulations (Ministry for Primary Industries, 2009).

Following discussions with Tangata Kaitiaki two points emerged. Firstly, that the Efish database provided an opportunity to improve local customary management. Secondly, that harvesting data including feedback from harvesters could be used for sustainable management. From an administrative base, the Trust is able to monitor all permit information loaded on the database within the rohe moana. When this information is up to date Efish is a useful planning tool to assist with fisheries management decisions. It would indicate customary harvesting amounts from the rohe moana under the customary regulations. This can inform the Trust of areas that might need conservational management such as Mātaitai Reserve bylaws or rāhui.

Despite being an innovative tool (to capture customary fishing information) the reporting process needed to be streamlined to improve its effectiveness. Many issues were identified that prevented the database being used to its full potential. There was a low capability amongst Tangata Kaitiaki in computer operation. As well many did not have access to a computer or internet. Consequently, some Tangata Kaitiaki chose not to use the database.

Evaluation of permits issued by Tangata Kaitiaki over the study timeframe (2007-2012) showed a low number of permits were issued considering the large number of Tangata Kaitiaki. Many Tangata Kaitiaki were inactive. The database currently requires an administrator to enter all permits online. This defeats the purpose for Tangata Kaitiaki to input their own data. Resourcing is needed to administrate and report ongoing data. It is also necessary to provide an administrator for those Tangata Kaitiaki who prefer not to use a computer.

The actual catch component of the information was absent from the database. Tangata Kaitiaki need to follow up actual catch levels with harvesters to improve accuracy of customary harvesting information for Tauranga Moana. The use of text messaging to report actual catch quantities would help retrieve this information. The harvester would inform the Tangata Kaitiaki. The Kaitiaki would inform the database. The database would inform the decisions of the Trust.

Technical issues with the database itself were constant over the duration of the research. This made it difficult to evaluate the system accurately. Manual input of data on to excel spread sheet was required to accurately evaluate customary fishing statistics. Efish developers are currently upgrading the system. The new system will have broader reporting options. This will help reduce time spent on data analysis. Area maps of local fishing grounds will also be available within the new system.

Provision of induction and refresher training would address several of these current issues. Computer skills training would ensure proficiency for all Tangata Kaitiaki. Specific training of roles and responsibilities would clarify any policy and process issues. Appointments of Tangata Kaitiaki proficient in computer operation could streamline the induction process and improve the accuracy of reporting.

Improving the Efish database to suit the needs of Tauranga Moana is necessary. It will assist with broader goals relating to localised customary management. Improvements to the database should go hand in hand with training development and capacity building.

### Kai moana harvest trends

Gathering kai moana has been a part of life for many Māori families in Tauranga Moana. The Tauranga Harbour once teemed with fish that came into the harbour to feed on the abundance of shellfish. It is an important traditional resource that has provided sustenance to the families of Tauranga Moana and other travelers for many generations. The practice of mahinga kai is still an important part of culture and traditions in Tauranga Moana. The rocky reef environments around Mauao, Moturiki and Motuōtau are popular harvesting sites that are easily accessible. These sites provide kai moana species that marae often provide to manuhiri.

Most permits in Tauranga were issued for harvesting in the coastal mainland and harbour environments. Customary harvesting pressure was higher in these areas due to accessibility and the diversity of kai moana available from these sites. Species that were frequently harvested under customary regulations in Tauranga Moana were kuku, pāua, pipi and kina. Other species, koura and tuangi, were also investigated due to rising concern for their health and population status.

Table 1: Frequency that each species appeared on permits

SPECIES FREQUENCY TABLE						
NAME	2007	2008	2009	2010	2011	TOTAL
Cod	0	0	0	1	0	1
Kōura (crayfish)	8	19	6	18	14	65
Pātiki (flounder)	0	0	1	1	0	2
Gurnard	0	0	0	2	0	2
Hāpuka	0	1	0	0	0	1
Hoki	0	1	0	0	0	1
Kūkukuroa (horse mussel)	3	2	1	2	3	11
Kahawai	1	2	13	8	0	24
Kina	29	75	79	147	70	400
Mullet	1	2	4	0	1	8

## A COLLECTION OF READINGS FROM GRADUATE STUDENT THESES

Kuku (mussel)	9	22	28	119	33	211
Tio (oyster)	0	1	5	0	0	6
Paddle crabs	0	1	0	2	1	4
Parore	0	1	0	1	0	2
Pāua	11	40	49	91	50	241
Pipi	22	102	107	72	47	350
Red Moki	0	0	0	1	0	1
Tupa (scallop)	6	10	3	2	3	24
Sea cucumber	0	0	0	1	0	1
Tāmure (snapper)	1	12	5	12	6	36
Starfish	0	0	1	0	0	1
Tarakihi	0	3	0	7	0	10
Titiko	0	1	0	0	0	1
Trevally	0	1	0	4	0	5
Tuangi	5	12	6	3	0	26
Tuatua	0	0	9	4	1	14
Wetfish	0	3	0	2	4	9

Common harvesting trends included higher customary harvesting in 2010 of kina, pāua and kuku. All kai moana species that were studied in this research showed a decline in customary harvesting in 2011. This was an impact from the grounding of the cargo vessel *Rena*. The consequent oil spill and associated health risks prevented customary harvesting during a rāhui restriction period where the taking of all seafood was prohibited in Tauranga Moana until it was declared safe to eat again.

Kōura and tuangi appeared to have distorted results. This was caused by errors in the Efish database. Pipi results significantly increased in 2009 and significantly declined in 2010 and 2011. This was attributed to the serious health warnings that were issued in relation to eating contaminated shellfish from Tauranga Harbour.

Changing the weight conversion testing from units to kilograms (for each species recorded in units) was recommended by participants. This would ascertain a viable formula for providing more accurate tonnage amounts. It would also provide better information for local fisheries management decisions to occur. When the issue was raised with Efish developers they indicated that a default unit or kilogram measure can be set up for each species. This will streamline the system for entering harvesting amounts.

Ongoing analysis of customary harvesting information will be beneficial to Tangata Kaitiaki for making local fisheries management decisions. Baseline surveys of size and distribution of key kai moana species was recommended. This would be additional to ongoing analysis of customary fishing data. These monitoring methods would provide an estimate of how much kai moana is available and how much kai moana is extracted.

Catch records for recreational fishing is unknown and therefore difficult to take into account in this process. It is difficult to forge sustainable fisheries rules when a component of information is incomplete. Commercial and customary catches are recorded in Tauranga Moana and

recreational catch is not. Local fisheries management in the region could be improved if the quality of information from the recreational fishing sector was progressed.

Catch limits that the Ministry sets nationally does not always suit the sustainability needs at a local level. Customary fisheries management tools can be better utilised with access to the right information. Baseline surveys of shellfish and relative research will assist with meeting localised sustainability needs. To improve and enhance the quality of information, the Trust continues to work collaboratively with MPI, tertiary and research institutions and other stakeholders.

The customary regulations enable fisheries management tools to be applied to customary and recreational harvesting within the same harvesting areas. Therefore, the harvesting information base should be broadened to capture both customary and recreational harvesting. Recreational surveys can assist with this kind of data capture to provide long term monitoring and management of Tauranga Moana fisheries.

### Enhancement potential in Tauranga moana

Shellfish enhancement potential for Tauranga was investigated to assist with sustainability of local kai moana resources. Considerations highlighted for shellfish enhancement potential in Tauranga were; establishing and maintaining key relationships; key habitat requirements; species specific information; implementing further species and site-specific investigations; accessibility of harvesting sites; managing kai moana sustainably; and monitoring customary and recreational harvesting.

Tauranga is listed as one of the fastest growing cities in the country. It has a popular tourism industry, consistent residential growth and a booming industrial and business region. The pressure from harvesting, pollution and sedimentation on customary harvesting areas of Tauranga Moana has led to a decline in shellfish stocks (Tauranga Moana Iwi Customary Fisheries Committee, 2007).

Some key requirements for shellfish enhancement were adequate water quality, availability of suitable habitat and appropriate food resources for shellfish which is dependent on the species. Investigated species are primarily located in the Mātaitai Reserve area. This is a suitable area for adequate habitat and water quality. This is proven by the range of species that already inhabit this environment. It also provides an area that can be closely monitored and managed by the Trust.

Pilot enhancement studies are recommended to be carried out on inshore species within the Mātaitai Reserve. It is recommended that Mātauranga Māori is used to support the Trusts goals towards mana moana. Traditional and local knowledge about specific sites and species will support enhancement. It is recommended that Mātauranga Māori be used to set the framework for establishing key relationships and inform the process to maintain them. Establishing and maintaining ongoing relationships with organisations that have the capabilities, resourcing and facilities to assist with enhancement programmes is important. Enhancement programmes may require ongoing technical support from other organisations. This includes MPI, Bay of Plenty Regional Council, tertiary and research institutions, and the Port of Tauranga.

Existing site locations of rocky inshore habitat within the Mātaitai Reserve were highlighted as suitable areas for enhancement. This was based on existing habitat with adequate water quality. This is shown by existing populations of pāua, kuku, kina and kōura. The issue remains around the sustainability of those existing populations. This area provides a place that can be closely monitored and managed by the Trust. Mātaitai Reserve bylaws or rāhui can be applied in this location. Another important component for further research consideration is to evaluate growth

rates and reproductive ages for local kai moana species identified for enhancement.

Pāua and kuku demonstrated potential for reseeding and it is recommended that this occurs alongside habitat enhancement if possible. Further research should be undertaken to provide scientific advice on site specific requirements. This would include carrying capacity, mortality rates and water quality parameters for reseeding pāua and kuku.

A variety of species would benefit from habitat enhancement in rocky reef zones which could be either natural or artificial. Habitat enhancement would assist with the carrying capacity of the reefs. The preferred option is the introduction of natural reef habitat. Involvement in the Kaimoana Restoration Plan relating to port capital dredging can assist with this. The Trust needs to be strategic about choosing appropriate kai moana restoration sites when dealing with port dredging mitigation.

Artificial reefs were also highlighted for potential habitat enhancement that has been proven to enhance fish abundance and diversity. These structures include reef balls, biolinks and crayfish nursery pipes. These are made from materials that are not harmful to the environment and can be customised to suit specific species.

Enhancing habitat for inner harbour species was not a viable option due to land based impacts, harbour use and other environmental conditions. Other policy and management tools can assist enhancement by providing prohibited fishing areas, seasonal and temporary closures and customary rāhui. To enhance the state of kūkukuroa it was recommended that a Section 186A Rāhui Temporary Closure to prohibit scallop dredging in Tauranga Harbour is implemented.

A permanent prohibition on scallop dredging also needs to be sought by the Trust, primarily to protect kūkukuroa and tupa. This form of prohibition could assist habitat enhancement by mitigating damage to the harbour substrate. Enhancement of kai moana in Tauranga Moana is definitely viable and there are varying methods to apply enhancement programmes. Mātauranga Māori should set the framework for all facets of enhancement processes. To ensure that enhancement programmes are methodical, informed, scientifically robust and culturally intact, financial resources will be required. Future management and long-term monitoring are key parts of planning that need to be in place to ensure sustainability of enhanced areas.

Building the capacity of Tangata Whenua to manage and monitor these sites will provide the vehicle for generational succession of kaitiakitanga. Ensuring 'buy in' with Tangata Whenua is important in maintaining long term sustainability. The support from the whole community will also gauge the success of any enhancement project.

## Conclusion

Tauranga is one of the fastest growing cities in the country<sup>1</sup> which presents a wide range of issues that affect the fishery. Impacts include residential, commercial, industrial, horticultural and agricultural development. All mainland kai moana, shellfish beds, are easily accessible to harvesters. This becomes a concern during the consistently busy holiday season. With these points in mind, it has been difficult for Tauranga Moana Iwi to ensure the sustainability of kai moana in the region.

Customary fisheries management in Tauranga Moana binds the kinship of three Iwi through kaitiakitanga values. A unified environmental unit would support kaitiakitanga, address broader environmental issues and specifically improve customary fisheries management. This would

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1 Quickstats about Tauranga City



pool the resources of Tauranga Moana to deal with all environmental issues. It would improve infrastructure, administrative support, research and development and strengthen management practices.

Tauranga Moana Iwi Customary Fisheries Trust has a range of options that can streamline management processes and enhance fisheries management practice. This can be applied through an integration of Western and traditional techniques.

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## Glossary

Aotearoa	New Zealand
Aroha	Love
Atua	God
Āwhina	To assist
Hapū	Subtribe
Iwi	Tribe
Kaimoana	Food of the sea
Kaitiaki	Guardian
Kaitiakitanga	Active guardianship
Kawa	Protocols
Kina	Sea urchin
Koroua	Elderly
Kōura	Salt water crayfish
Kuku	Green lipped mussel
Mahi tahi	Work as one
Mahinga kai	Food-gathering places where food is traditionally gathered
Manaakitanga	Hospitality
Mana	Prestige, authority, control, power, influence, status
Manuhiri	Visitors
Māori	The indigenous people of Aotearoa
Marae	Ancestral house
Mātauranga	Knowledge
Mauri	Spiritual life principle
Moana	Ocean/Sea
Mokopuna	Grandchildren
Ngā	The (plural)
Papatūānuku	Mother Earth
Pāua	Abalone
Pipi	Edible bivalve
Rāhui	Temporary Closure restricting harvesting
Rangatiratanga	Sovereignty, right to exercise authority
Rohe	Region
Taonga	Treasure
Tangaroa	God of the Ocean
Tangata	People
Tapu	Sacred
Tikanga	Correct procedure, custom
Tuangi	New Zealand cockle
Tupuna	Ancestors
Wairuatanga	Spirituality
Wāhi tapu	Sacred place
Waka	Canoe
Whakapapa	Lineage, genealogy
Whānau	Family
Whenua	Land

*Te Rangahau Taiao  
ki Awanuiārangi*

## CHAPTER FOUR

### **THE RENA AND EAST COAST COMMUNITIES.**

*Mooney, W. (2015).*



**WIKI MOONEY**

Ko Maungapōhatu tōku maunga  
Ko Tauranga tōku awa  
Ko Tūhoe tōku iwi  
Ko Ngāi te Kahu, Tamaruarangi, Ngāi Tama, Te  
Whakatāne me Tamakaimoana ōku hapū  
Ko Tāwhana, Rāroa, Matahī, Whakarae, me Māpou ki  
Maungapōhatu ngā marae  
Ko Wiki Mooney ahau

**Work:** Compliance Officer at Bay of Plenty Regional Council

**Qualifications:** Master of Maori Studies (First Class Honours), Bachelor of Environmental Studies

**Background:** Born at Whakarae in Te Urewera and raised by grandmother and the influence of both the Ringatū and Christian faith.

## Abstract

On 5th October 2011, the Motor Vessel (MV) *Rena*, a 236-metre-long 37,209 tonne cargo ship, had been enroute to Tauranga from Napier, when it ran aground on Ōtāiti (Astrolabe Reef) at 2:20am. Ōtāiti is approximately 11.1 kilometres north of Mōtītī Island and 22.2 kilometres east of Mauao (Mount Maunganui).

The ship at the time of the incident was reported to have been carrying 1,733 tonnes of heavy fuel oil (HFO), 200 tonnes of marine diesel and 1,368 shipping containers.

Approximately 350 tonnes of HFO was released into the sea when the hull of the ship was ruptured after the bow became impaled on the reef. Within four days of the incident, a 5-kilometre-long oil slick was observed spreading along Papamoa Beach, covering sandy beaches, rocks and marine animals.

Containers, polystyrene, oil and other items were washed up on the beaches extending from Waihi Beach through to Maketū. Similar items were also found within the rocks, on the beaches and along the high tide areas of the east coast from Hāwai through to Tihirau (Cape Runaway), which is within the rohe (boundary) of Te Whānau ā-Apanui, in the weeks following the incident.

Communities within the Te Whānau ā-Apanui rohe, place great importance on mauri (life essence), and firmly believe that oil from the MV *Rena* has had an impact on the mauri of their coastal environment. These same communities a year later, still feel that the effects from the MV *Rena* incident has affected them emotionally and culturally, and especially with the added uncertainty regarding the loss and whereabouts of shipping containers which may contain potential pollutants to the environment.

This dissertation aims to determine the implications of the failure to communicate effectively with affected communities residing within Te Whānau ā-Apanui environment in a crisis, and the impact the oil spill has had on these communities.

## Introduction

The Exclusive Economic Zone (EEZ) around Aotearoa (New Zealand) covers an area of just over four million square kilometres and is fifteen times larger than the country itself (Te Ara, 2012; Environmental Protection Authority, 2013). Aotearoa with its geographical isolation, geological history, range of habitats and some major ocean currents has been heralded internationally as a lush, clean, green country with plentiful waters with a highly diverse coastal marine ecosystem and species (Department of Conservation, 2000; Ministerial Advisory Committee on Oceans Policy, 2001).

There has been a significant increase of all types of oil tankers/bulk carriers/container ships travelling through New Zealand coastal waters. Some near misses have occurred around the coastline and serve as a poignant reminder of the continual threat to the environment. Many ships have over a period of years, foundered and have been wrecked off the rugged New Zealand coastline and surrounding seas (Maritime New Zealand, No date) and the possibility of a major oil spill occurring within New Zealand's EEZ is higher today than it was 20 years ago. A major spill could cause widespread ecological damage, which could cripple and/or destroy the marine environment, for many years.

The residents within Te Whānau ā-Apanui rohe rely heavily on the marine environment for such things as fish and shellfish, as well as maintaining recreational, aesthetic and spiritual ties to the coastal marine area. The sustainability of our territorial sea is therefore of paramount importance.



Marine groundings usually occur without warning and some oil spills that have occurred from a small number of these ships have shaped the way Maritime New Zealand (MNZ) responds to maritime incidents.

The grounding of the MV Rena on the Astrolabe Reef on 5 October 2011 (which was to become New Zealand's worst maritime disaster) concerned many people and none more so than those people of Te Whānau ā-Apanui. They had never experienced environmental pollution and contamination to such a degree. It was viewed as an intrusion of unknown chemical pollutants into the very fabric of their spiritual beliefs. The arrival of oil and debris onto their beaches and the possible short and long-term effects of the oil on the environment and in particular, the health of the kaimoana (seafood), were of great concern to them, as the ocean has been a food basket for the people of Te Whānau ā-Apanui for a long time.

*"The people were in distress because throughout Te Whānau ā-Apanui from Hāwai to Pōtaka the sea is the food basket of the people of Te Whānau ā-Apanui. Therefore, we are saddened and concerned for the children of Tangaroa,"* (Wharepapa, 2013).

Prior to the MV Rena oil spill, the people had never had any concerns about their resources, being able to harvest whatever they wanted, whenever they wanted without worrying about the safety of consuming anything. Oil and debris from MV Rena threatened that.

Heavy metals and polycyclic aromatic hydrocarbons (PAHs) which are found in heavy fuel oil such as that which leaked from MV Rena are toxic to marine life and can accumulate through the food chain. A research team led by Professor Chris Battershill from Waikato University worked with researchers nationwide on an environmental monitoring programme, integrating Māori perspectives into the research, with input from iwi. A preliminary survey undertaken by the University of Waikato in November 2012 found that PAH contamination was restricted to an area of about 100m either side of the grounded vessel.

Professor Chris Battershill was reported by Rena recovery (2013) as saying that the strong offshore wind conditions at the time had dispersed the oil and the dispersant Corexit which was used, and that tar balls washed up on the rocky reefs along the East Coast has largely disappeared, although debris and containers from the ship continue to wash ashore. The local people participated in the clean-up activities resulting in less time to engage in seasonal subsistence activities and disruptions of cultural traditions. They however believe that cleaning, monitoring and restoring the marine environment to a state their ancestors enjoyed would continue for a long time (Rena recovery, 2013).

## MV Rena

The MV Rena was launched in April 1990 and registered as Zim America. In the year 2004, the ship was re-registered under the Maltese flag and renamed Andaman Sea in 2007. It was eventually acquired by the Davina Shipping Company which is a subsidiary of Greek Costamere Incorporated. The new owners re-registered and renamed the ship Rena, in Liberia sometime during the year 2010 (Julian, 2012, p.45-47). The MV Rena at the time of the incident weighed 37,209 tonnes and was 236-metres-long.

The container ship was committed in 2011 to a five-year charter agreement by her owners with the Mediterranean Shipping Company (MSC) but was not equipped with the latest navigational systems. These navigational systems included such things as global positioning systems, chart plotter or its equivalent of an Electronic Chart Display and Information System (ECDIS), which would display the ship's position, course, depth sounder information as well as locating and

identifying other ships in the vicinity (Julian, 2012, p.48-49).

At 10:20am, 4th October 2011, the 21-year-old container ship MV Rena, left Napier with a crew of 25, enroute to Tauranga. The container ship was reported to have been carrying 1368 shipping containers, of which 30 were, listed as containing dangerous goods, 1733 tonnes of HFO and 200 tonnes of marine diesel (Maritime New Zealand, 2012).

At 2.20am on the morning of 5th October 2011, the ship, which was travelling at 21 knots, (Maritime New Zealand, 2012) ran aground and was impaled on Ōtāiti or what is commonly known as Astrolabe Reef, thus beginning one of the biggest salvage operations in New Zealand history.

The reef is approximately 11.1 kilometres (km) north of Mōtiti Island and 22.2 km's east of Mauao (Mount Maungānui). The grounding of the MV Rena as stated by Nick Smith on 12th October 2011 "*is the most significant maritime environmental disaster in New Zealand to date*" (Radio New Zealand News, 2011; The New Zealand Herald, 2011).

### Safe seas, clean seas

On 9th October 2011, a 5-kilometre-long slick was seen spreading across the surface of the sea toward Papamoa Beach. During the night of 11th October 2011, rough weather with a heavy sea and a large swell set in. The vessel's list shifted from port to starboard resulting in the loss of approximately 350 tonnes of HFO into the sea. On 12th October 2011, a reconnaissance of the site revealed that the vessel's list was 17 degrees causing the loss of 88 shipping containers.

Sightings of oil-covered containers from MV Rena were found washed up on beaches at Te Kaha, Whangaparāoa and Tihirau (Cape Runaway) in the eastern Bay of Plenty on 17th October 2011. A coastal navigation warning for the inclusion of Te Kaha, Te Araroa, Cape Runaway and Lottin Point in the clean-up was not issued until 19th October 2011.

Small quantities of HFO amounting to between 5-10 tonnes continued to leak from MV Rena on the 22nd and 23rd October 2012.

### Te Whānau ā-Apanui

The thirteen hapū of Te Whānau ā-Apanui which are situated along the narrow coastal strip between the Raukūmara Range and the sea are linked by State Highway 35, which extends from Opōtiki to Gisborne. The people of these sparsely populated communities organise themselves around local marae (Wildland, 2011), and continue to manage, maintain and to care for the land and sea in a culturally responsible way.

The people of Te Whānau ā-Apanui says Ngāmoki (2013) and Waititi (2013), have maintained strong cultural and spiritual connections to their lands and sea regions, and know the impact, oil would have on the tribe's relationship with the environment. There is also a realisation of the irreparable harm any oil spill would cause to not only their environment but also to their culture, livelihood and the spirit of their unique way of life, (Gage, 2012).

The disruption of that balance says Gage (2012), would be untenable for the people as it has the potential to sabotage the sacred life force or "mauri" of resources both animate and inanimate. Te Whānau ā-Apanui today own 97.3% of the lands adjoining the coastline and have maintained

mana, strong cultural and spiritual connections over its lands and sea since before 1840, (Gage, 2012).

The iwi of Te Whānau ā-Apanui are currently being represented by the tribal authority known as Te Rūnanga o Te Whānau. Te Rūnanga o Te Whānau have successfully managed a fisheries operation, and have become increasingly involved in social services and other economic developments such as forestry. The impact of any type of pollution on their kai moana (seafood) raises very deep concerns amongst them. The experience of the Rena incident has raised genuine fear for the residents, at the possible damage that could be caused to seafood stocks. However, rather than dwell on anger and frustration, the residents within Te Whānau ā-Apanui rohe focused their energy on cleaning up the pollution along their beaches as quickly as possible (Rua, 2013; Pook, 2013). Resources such as safety footwear (gumboots), coveralls, gloves, and other items along with extra manpower were supplied by Incident Command Centre (ICC) after much debate (Rua, 2013; Pook, 2013).

### Maritime New Zealand

A report in Maritime New Zealand (2011) stated that, "MNZ worked closely with local iwi to coordinate the clean-up." This was refuted by residents who reside in Te Whānau ā-Apanui rohe (who wish to remain anonymous), stating that staff at the Incident Command Centre (ICC) which was located in Tauranga failed to inform and update locals of what was expected of them. People were sent by the ICC to the Te Kaha area and beyond, without providing them proper and adequate training relating to Māori culture and/or any understanding of kaitiaki/kaitiakitanga (caretaker). For instance, kaitiaki and kaitiakitanga are Māori concepts which have been translated in legislation, and in particular the Resource Management Act 1991 (RMA), as loosely meaning guardians/stewards and guardianship/stewardship respectively, which according to Tomas (1994), are *"two terms arising out of feudal England that has also been reduced from a fundamental principle of Māori society to one factor for consideration."*

People ignored warnings to stay away from the beaches and began scraping up contaminated sand, filling up little plastic bags with the material and leaving them where they could be seen and later collected. The Rena response team soon realised the value of the operation, and scheduled meetings, which was attended by planners, operations staff, New Zealand Defence Force (NZDF), health and safety, including iwi liaison.

An important component of the programme was to have regular communication so people knew what was happening and could make their own decisions as to how, when and where they could help. Closer relations with iwi liaison provided the conduit into the ICC for Maketū, Mōtītū and Matakana Island clean-up, (Maritime New Zealand, 2011). Recovery of communities whose lives have been disrupted and affected physically, socially, emotionally and economically by any type of disaster involves communication. The co-ordination of a number of different parties and these issues, are advocated widely in both international and New Zealand based literature, (Becker, Saunders & Kerr, 2006).

### Kaitiakitanga - an introduction

Traditional Māori beliefs are derived from a mixture of a complex and evolutionary belief system. These beliefs are based on a mixture of traditional and contemporary values by which Māori form the basis for explaining the Māori world-view.

There are two processes that evolved from this belief system of which one was the ground rules (kaupapa) that was initiated and implemented by the gods (atua) when they separated their parents, Rangi and Papa. These ground rules were closely followed by the process known as tikanga, which could adapt to changes, maintain the mauri of the natural world as well as evolving into the ethic of kaitiakitanga

Mauri can be described as the life force present in all things, generating, regenerating and upholding creation and the binding together of the physical and spiritual elements of all things. Kaitiaki responsibilities are based upon Māori principles that are relevant to Māori in their area and cannot be defined by other persons. The role of kaitiaki traditionally belongs with a whānau or person who had developed a relationship with their ancestral lands waters, wāhi tapu sites, and other taonga. Kaitiaki responsibilities are based on Māori principles relevant to Māori who have developed a relationship with their ancestral lands waters, wāhi tapu and other taonga.

An amendment to the Resource Management Act (1991) in 1997 specifies kaitiakitanga to mean "the exercise of guardianship by the tangata whenua according to tikanga Māori." The responsibilities of kaitiaki are wide and are based upon Māori kawa (protocol), whakapapa (genealogy), mana whenua (authority over land or territory), ahi kā principles (keeping one's fires alight, signifying use and occupation), and rangatiratanga (sovereignty). These are all relevant to Māori in their particular area and cannot be defined by other persons, however, groups according to their values and circumstances of each case can determine them, (Roberts, Norman, Minhinnick, Wihongi & Kirkwood., 1995).

The role of kaitiaki would traditionally belong with a whānau or person. Kaitiaki of a spiritual nature for instance is a tribal guardian that has been left behind by deceased ancestors to watch over their descendants as well as to protect sacred places. However, there are many different relationships that Māori people can have with natural and physical resources.

In New Zealand, the Treaty of Waitangi gives Māori values an equal place with British values and a priority when their taonga is adversely affected. Therefore, kaitiakitanga is an element, which is critical in activities that impact on resource management and fisheries. The ethic of kaitiakitanga is very important as iwi and hapū assert their mana under current environmental legislation. The Māori world-view provides foundations upon which kaitiakitanga is encapsulated. Māori values provide a way in which Māori make sense of, analyse, experience and interpret the world. They are based on a mixture of traditional and contemporary beliefs and form the basis for explaining the Māori world-view. In Māori tradition, all elements of the natural world are related through genealogy (whakapapa) which is the backbone of all Māori history and is a similar view held by Roberts et al., (1995). The natural world reflects the relationships created through Rangi and Papa who were the founders of Kaitiaki. All living things are their descendants and became the guardians (kaitiaki) of their various domains (Binney, 1987; Marsden, 1992).

From kaupapa the gods evolved, followed by tikanga, which had values that underpin kaitiakitanga and set the ground rules, (Bay of Plenty Regional Water and Land Plan, 2008).

Practices of tikanga were regarded as a custom deemed to be correct in achieving a desired outcome or objective. Over many generations tikanga was developed to maintain the mauri of the natural world, (Bay of Plenty Regional Water and Land Plan, 2008, Marsden, 1992). Tikanga varied from Iwi (tribe) to Iwi due to differences in physical environments and social and tribal practices. Values such as whanaungatanga, mana, tapu, utu and kaitiakitanga underpin tikanga. All these values are closely interwoven and they do not stand alone, (Bay of Plenty Regional Water and Land Plan, 2008, Law Commission, 2001). Practices of tikanga helped maintain the

mauri of parts of the natural world, eventually evolving into the ethic of kaitiakitanga, (Bay of Plenty Regional Water and Land Plan, 2008).

Mauri, is the life force, which is present in all animate (person, birds, fish, etc.) and inanimate (mountain, river, rock, etc.) (Schwimmer, 1963, Roberts et al, 1995). Mauri, linking back to Rangī and Papa, binds one resource to all other elements in the natural world whether physical or spiritual. Mauri also provides Māori, a series of formal relationships, which when recognised in practice and prayer ensures physical and spiritual integrity of the environment for future generations, and may be described as the cornerstone of Māori cosmology.

Rangatiratanga which is an element of kaitiakitanga has been practiced for hundreds of years. The word kaitiakitanga is a modern expression, brought about through environmental discourse, particularly environmental legislation and policies such as the Resource Management Act (RMA) 1991, to recognise and provide for Māori. However, inclusion of kaitiakitanga in the RMA has divorced kaitiakitanga from its Māori cultural and spiritual context, (Tomas, 1994). Kaitiakitanga is the key means by which sustainability (the definition of which is kaitiakitanga) is achieved by avoiding adverse effects on the environment.

Māori are also adamant in their views that, whether or not it has been sold into private hands, they still retain their kaitiaki responsibilities to ensure that the spiritual and cultural aspects of these natural and physical resources are maintained. This expression of authority is rangatiratanga and is held by manawhenua within a tribal area. It would be remiss not to mention the Treaty of Waitangi, for as the Waitangi Tribunal put it: the expression of authority is rangatiratanga which is an element of kaitiakitanga. Māori would never have signed the Treaty if the Crown did not assure them of protecting their rangatiratanga for as long as they wished (Tahitanga, 1998).

Such a meaning does not however marry in all respects with the Māori concept of kaitiakitanga. The word kaitiakitanga is a recent development, the underlying principles having been practiced for hundreds of years. In traditional Māori society, there was no concept of ownership, just "user rights", and as adequately put by Marsden and Henare (1992), man does not own the resources of the earth, man instead comes from the earth and therefore defining by reference to stewardship (which connotes guarding someone else's property) is incorrect. Kaitiakitanga means more than just mere guardianship. It is the intergenerational responsibility inherited at birth to care for the environment, which is passed down from generation to generation. The purpose of kaitiakitanga is not only about protecting the life supporting capacity of resources, but of fulfilling spiritual and inherited responsibilities to the environment, of maintaining mana over those resources and of ensuring the welfare of the people those resources support. Kaitiakitanga is the key means by which sustainability is achieved.

### Māori System of Resource Management

Prior to the colonisation of New Zealand by Britain, Māori were the exclusive developers, managers and users of natural and physical resources in Aotearoa. The basis of Māori ethics in resource management or rather, the activities of kaitiakitanga were rooted in traditional narratives. All things in the environment share a "common ancestry", and are required to exhibit virtues of respect and responsibility for each other, (Patterson, 1994). Barlow (1987) supports this view "in that all elements of the natural world are related through genealogy (whakapapa) which is the backbone of all Māori history and the natural world reflects the relationships created through Ranginui and Papatūānuku."

The "common ancestry" described by Patterson (1994) could be viewed as a policy or objective, linking to other ideals such as mauri, tapu (sacredness) and tikanga while working to achieve an environmental balance, as perceived by Māori.

Planning and resource management, albeit in a tribal bioregional sense, was therefore evident in New Zealand prior to British colonisation. What remained says Royal (1998), particularly at the commencement of our shared history, has been a Māori legacy of at least 800 years of "kaitiakitanga" and a Treaty partnership, which provided colonial decision makers the option of a resource management foundation to build on. Management is related to the tino rangatiratanga and partnership principles of the Treaty of Waitangi. In relation to the environment, Māori see themselves as having rangatiratanga.

Kaitiakitanga or guardianship is the cornerstone of Māori environmental management systems. Given the complexity of the concept of kaitiakitanga and the different meanings it holds for different iwi, the most appropriate way to determine what kaitiakitanga means, is to ensure consultation with individual hapū throughout the region, (Law Commission, 2001, Palmerston North City Council, 2000). Kaitiakitanga is often applied to the obligation of whānau, hapū and iwi to protect the spiritual wellbeing of the natural resources within their mana. The recognition of kaitiakitanga implies the recognition of kaitiaki as the implementers in any kaitiakitanga system.

Many existing Māori structures perform governance and kaitiakitanga roles through Rūnanga, Trust Boards, Trusts, and new entities that are currently been established and legitimised by mandate. The governance role undertaken by Māori extends to and includes a 'holistic' range of areas that extends well beyond the narrow constructs of a system known to Government and colonisers (Huta, 2001).

### Aim and Research Questions

The aim of this research seeks "to investigate the programs in place to monitor the environmental and social effects that the oil discharged from the MV Rena has had on rural coastal communities." It aims to evaluate the effectiveness of the response to MV Rena, particularly in communication with all parties, and to set up an action plan for any future oil spills. An additional aim of the research is to gather information of available reports and literature produced, and to conduct one on one interviews with residents of rural coastal communities and specifically, residents from Hāwai through to Tihirau. The research is to document the effects at the time of the Rena oil spill incident, as well as identify any on-going social, cultural, environmental and emotional effects from the incident.

### Qualitative approach

The decision was to adopt a qualitative approach because it would emphasise the need to understand the experiences, reflection and interpretation of people's everyday social worlds and realities, (Dwyer & Limb, 2001; Winchester, 2003). Interviews with people from Te Whānau ā-Apanui and comparisons with similar research conducted after two major oil spill disasters overseas were conducted including (1) The British Petroleum (BP) incident in the Northern Gulf Coast of Mexico and the (2) Exxon Valdez oil tanker, incident in Prince William Sound, (Vargas, 2010).



## Participants

The people who participated in this exercise were Māori and were affiliated members of Te Whānau ā-Apanui. Six were male, three were female and their ages ranged from forty years to seventy years and all had a role to play in the clean-up operations. For instance, four of the participants were kaumātua (elderly), then there was a principal of the local school, a chief fire officer of the local Fire Brigade, a staff member of Te Whenua Rāhui, two staff of Te Rūnanga o Te Whānau and a manager of the local store at Te Kaha.

## Methodology: Kaupapa Māori Research

This dissertation is firmly located within the principles of kaupapa Māori research methodologies, where understandings are co-constructed by participants and the researcher within the research process that promote and protect Māori people and Māori knowledge.

This view is supported by Te Awekotuku (1991) who constructed seven guiding principles for researchers to consider when working within a kaupapa Māori research methodology.

This dissertation seeks to promote and protect Te Whānau ā-Apanui traditional knowledge and the relevance of lived experiences and opinions of all participants within the research study. It takes for granted that all interviewee's participation and knowledge is respected and protected by the researcher and those for whom this research is for. This dissertation positions Māori 'ways of knowing' as a valid and legitimate foundation, towards positive, reflective, transformative action directly benefitting Te Whānau ā-Apanui and our oceanic environments.

## Methods

The interview was chosen as the preferred research method. an invitation to conduct the research was extended to Te Rūnanga o Te Whānau and was sanctioned by the Chief Executive Officer (CEO). Prior to an interview, each interviewee was provided with semi-structured questions. At the time of the interview each interviewee was given a list of questions, which were written in both Te Reo Māori (Māori language) and English so they could follow the questions as they were being asked. The interviews were conducted to allow for a more 'natural' conversation to occur and unanticipated insights to emerge.

Most interviews were conducted between March 2013 and May 2013 and the remaining interviews were conducted between August and October 2013 at the availability of the participants.

All the interviews were audio taped with the verbal approval of the participants, and these were directly transcribed in whole. The answers provided by the interviewees will be pooled rather than reported separately to ensure the interviewee's anonymity is maintained and no bias as per the interviewees standing within the community. Copies of the interviews will also be transcribed from Te Reo Māori (Māori language) into English.

## Findings - the interviews and comparisons with two International oil spill disasters

The coastal and open waters of Prince William Sound and the Gulf of Alaska were, according to Short and Harris (1996), considered pristine prior to the EVOS incident. The currents circulate water from the Gulf into the Sound and back out into the Gulf contributing to the pristine character of the ocean waters, and worked to distribute the oil into far distant areas, (Russell, Downs, Strick & Galginaitis, 2001).

The coastal and open waters of the Bay of Plenty region are very similar in nature and were considered pristine prior to the Rena incident. In the same way, the ocean currents and tidal streams have been described as complex and varying with the seasons. Off the east coast of New Zealand are two broad developments in which secondary eddies are formed. The currents circulate water from the Tasman Sea among the offshore islands and along the East Coast into the Bay of Plenty. Topographical diversion sends some of this water northeast into the general ocean drift while the remainder continues around the East Cape and south to Hawkes Bay, and on to Cook Strait, (Transport Accident Investigation Commission, 2011).

MNZ was stated in [http://en.wikipedia.org/wiki/Rena\\_oil\\_spill](http://en.wikipedia.org/wiki/Rena_oil_spill) as requiring the beaches in Tauranga and Maketū closed to the public following the MV Rena incident.

As stated earlier, people ignored warnings to stay away from the beaches and many expressed frustrations at not being able to help;

*"Locals, many upset at a perceived lack of action by authorities, took to the beach and filled buckets with the toxic globs, ignoring signs telling them to stay clear of the oil for the sake of their health,"* (Stuff.co.nz, 2011).

Murdoch (2013) claims that because MNZ were unsure of the toxicity of the oil and risks of legal consequence, denied the people access onto the beaches and actually warned them not to touch any of the oil or oily waste. Bay of Plenty Regional Council and municipal leaders of Tauranga put a case forward for volunteer participation designed to meet MNZ's concerns. The recommendation was accepted by MNZ and strongly encouraged by the then Minister, Steven Joyce, (Murdoch, 2013).

As mentioned earlier, thirteen hapū of Te Whānau ā-Apanui are linked by State Highway 35, which extends from Ōpōtiki to Gisborne, and the people of these sparsely populated communities organise themselves around local marae, (Wildland, 2011). The thirteen hapū continue to manage, maintain and to care for the land and sea in a culturally responsible way.

Similar concerns related to the Exxon Valdez Oil Spill (EVOS) incident in that Exxon's unwillingness distressed communities to allow them to engage in early clean-up activities. Despite being ready and willing, the residents of local communities were held back by Exxon citing concerns about liability and "amateurs" engaging in clean-up work. Efforts to acquire assistance from Exxon was unsuccessful (Russell et al., 2001).

Damages resulting from the Gulf of Mexico spill (Smith, Smith and Ashcroft, 2010) are attributed to human error and failure and one of the major issues was the pace of the response, and the fact that BP would not allow private help without going through a lengthy permission process. This was a battle fought by local people who were familiar with the area, equipped to help, but were prohibited from doing so (Griggs, 2011).

Chess, (2010), cited an article from Greenwire about;

*"Depressing similarities between Exxon's and BP's risk communication smash-ups, shifting blame from the corporation, emphasizing science rather than people, and initially downplaying the potential impact of the disaster,"* (Chess, 2010 p.216).

## Resources and capability

The events of 5th October 2011 changed perceptions about who is at risk when an event such as the MV Rena becoming lodged on Ōtāiti (Astrolabe Reef) approximately 11.1 kilometres north

of Mōtiti Island and 22.2 kilometres east of Mauao (Mount Maunganui), became a reality. Bay of Plenty Regional Council had begun to gear up the volunteer program one week after the Rena grounding with staff from various government organisations being seconded for the exercise, along with offers of logistical support from various other agencies. Processes, structures and roles, which changed over time, were set in place to ensure, beach clean-ups could happen quickly, safely and efficiently. From day 1 of the incident, the workforce population in the ICC grew from a staff of 25 to 200 people and included a third of Bay of Plenty Regional Council staff. From the second week of October to early December, approximately 800 people, which included trained oil responders from around the country arrived in Tauranga, (Murdoch, 2013).

In total, 8,061 volunteers were registered in the volunteer database along with several vessels on standby with approximately 600 metres of ocean-going booms from around New Zealand (ready to be deployed), (Rena Recovery, 2012). Within four days of the incident, a 5-kilometre-long oil slick was seen spreading along Papamoa Beach, covering sandy beaches, rocks and marine animals.

Initially, Maritime New Zealand (MNZ) used Corexit 9500 to break up the oil around the source of the spill. Dr Simon Boxall, who is a lecturer at the University of Southampton, was quoted by Cooke (2011) as saying;

*“The dispersant could be more harmful than the oil itself, was banned by the United Kingdom (UK) in 1998, while Sweden on the other hand has banned its use in the marine environment,”*

*“In their raw form, some dispersants can be very toxic and I believe will do more harm than good,”* Cooke, M., (2011).

Environment Minister Nick Smith said that;

*“1800 litres of the dispersant had been used. The product was approved by the Environmental Protection Agency (EPA) and was no more toxic than dishwashing liquid, (Stuff.co.nz, 2011).”*

As stated in [http://en.wikipedia.org/wiki/Oil\\_dispersants](http://en.wikipedia.org/wiki/Oil_dispersants), one third of the world's supply of Corexit was purchased by BP and an estimated 1.84 million gallons (6,965,158 litres) was dispersed over the oil affected area.

Unlike the BP and Rena incidents, less than 4,000 gallons (15,141 litres) of dispersants was available for use at the time of the Exxon Valdez oil spill. As there were no aircraft available with which to dispense of the dispersant the exercise was eventually called off and abandoned, [http://en.wikipedia.org/wiki/Oil\\_dispersants](http://en.wikipedia.org/wiki/Oil_dispersants).

Sightings of oil and/or oil-covered containers from MV Rena as mentioned earlier, were seen on beaches from Te Kaha through to Tihirau (Cape Runaway) in the eastern Bay of Plenty on 17th October 2011. Inclusion of the area in the clean-up was not issued by ICC until 19th October 2011 but did not include resources as mentioned by the interviewees;

*“The resources remained in the other regions. They didn’t really send us anything, we received very little resourcing, however most of it went elsewhere to Papamoa, Mount Maungānui and Maketū. The resources were at those places where the well-off people were. The poor people, we had hardly anything to do our work with,”* (Waititi, 2013).

A similar situation occurred along the east coast of the Bay of Plenty which is stated by Ngāmoki (2013):

*“We waited for some officials to come down and tell us. In the end, everybody just got frustrated*

*and said stuff it. Went and got some bread packets, turned them inside out and those were our gloves. Not mine, but everyone on the beach. Because by the time we got down to Waihau Bay the locals had already started to clean up. Just the local whānau aye, got down on the beach and away they went ... off we went down the beach and then slowly things started to trickle in like the overalls, the gloves, gumboots and the bags. The bags were probably the biggest thing.”*

No one could predict the range of impacts from the oil which discharged into an ecosystem with commercial, spiritual and cultural importance for the communities within Te Whānau ā Apanui.

### Social Stress

On the morning of October 17th, 2011, oil-covered containers from MV Rena were found washed up on beaches at Te Kaha, Whangaparāoa and Tihirau in the eastern Bay of Plenty.

The frustration of Waititi (2013) was clear when he spoke;

*“That is the disaster, the Rena. There was only a small amount of oil that spilt into the sea however it was catastrophic. Te Whānau ā-Apanui suffered, the mana of Te Whānau ā-Apanui suffered because its mana is from the sea,”* (Waititi, 2013).

People on individual levels, experienced depression, while others were angry, fearful, and, in the words of Rua (2013) and Green (2013);

*“We were dismayed of course that the oil and debris had arrived on our shore. Our immediate concern was our kaimoana.”* (Rua, 2013).

*“That’s when it first really dug in to me when I saw the rubbish, the paru on the rāpihi (slick on the rubbish), the hinu (oil)”* (Green, 2013).

Māori residing within Te Whānau ā-Apanui rohe were concerned about the toxic effects of the spilled oil at the time of the incident. These same people continue to be concerned about the containers that were lost overboard and were not found and/or retrieved and the effects of the contents on fish and shellfish when the contents come into contact with sea water.

Gage (2012) reinforced this in his affidavit to Minister of Energy;

*The recent ‘Rena’ ship disaster off the coast of Tauranga further emphasised for the iwi (Te Whānau ā-Apanui), the impact that oil spills could have on our interests. The Rena’s grounding on the Astrolabe reef resulted in the escape of containers and oil. The former was capable of creating a potential boating disaster while the latter increased the possibility of catching or even eating oil contaminated seafood. The resulting Marine Fisheries ban on taking shellfish from certain sea regions also included Te Whānau ā-Apanui sea areas. This was an unmitigated disaster for us as a tribal group that relies on the food resources from our sea regions to sustain our people throughout the year* (Gage, 2012).

The natives of Alaska were in many ways the most impacted and devastated of all the groups by the Exxon Valdez oil spill. The oil spill shook the cultural foundation of the natives by threatening the wellbeing of the environment and disrupting subsistence behaviour and culture. The environment for the natives not only has sacred qualities, but their survival depended on the wellbeing of the ecosystem and the continued maintenance of their cultural norms of subsistence (Gill & Picou, 1997).

Indeed, none of the rhetoric about the volume of oil spilled, or the number of otter and bird deaths, could overshadow the difficulties of the native people of Te Whānau ā-Apanui, Prince William

Sound, and the Gulf of Mexico who were living within communities in the path of the spill.

The environmental disaster created by the spill caused health and economic needs for the people within the Bay of Plenty, and while all of the impacts are still unknown, the effects of the spill are expected to continue for some time. Stress among individuals and community groups is heightened, when their ties to resources are damaged or threatened, resulting in a loss of trust in institutions and organisations charged with protecting them from the risks of modern technology (Picou, Marshall and Gill, 2004). During the first few months of the oil spill, says Picou and Gill (1997), natives of Alaska encountered many problems including emotional disruption and dislocation created by large contingents of people and technology to PWS.

### Cultural differences/awareness

Native and non-native communities according to Russell et al. (2001) have cultural and spiritual connections to natural resources. Culture for indigenous peoples, is a system of beliefs, values, and world views that allow groups to interpret and assign meaning to objects, events, relationships and social conditions. These elements of culture contain and express the history, values and beliefs about the world and embody the shared experiences of a social group (Spiro, 1984).

An excerpt from the Whangaparāoa, Waihou Bay, Raukōkore and East Cape Region Rena Cultural Impact Assessment;

*“This is our tūrangawaewae. Most us have been born and bred here. We are tangata whenua, we smell, we breathe the fresh air of our environment. The Rena grounding brought an intrusion of our privacy, our domain. It was if no one really knew who we were or no one wanted to know that we even existed. We felt part of our mana, our whenua, our takutai moana, our tūrangawaewae had been stripped from us,”* (Rena Cultural Impact Assessment report, East Cape Region, 2013).

Communities east of Ōpōtiki and within Te Whānau ā Apanui are small and isolated with strong economic, social, and cultural ties to renewable resources, particularly fish and shellfish. Most people follow a protocol that is based on tikanga of which one is karakia (prayers). Karakia is conducted at the start of each day as well as prior to meetings, activities and/or incidents such as the MV Rena;

*“I mōhio au I tētahi kaumātua I konei i haere ki te whakarite karakia i te wāhi tūkinotia. Yeah i mua i te tīmatatanga o te mahi, (I know of one elder from here who went to say a prayer at the spot that was affected, yeah before the start of work)”* (Pook, 2013).

The people of Te Whānau ā-Apanui felt let down and overwhelmed by the ICC and their staff who were sending people to help with clean-up at the east coast but were not informed about Te Whānau ā-Apanui cultural issues/concerns. As mentioned in the Whangaparāoa, Waihou Bay, Raukōkore and East Cape Region Rena Cultural Impact Assessment;

*“Land ownership in our area is predominantly still under whānau control and all our manuhiri had to be made aware that access had to be gained from the respective whānau prior to any jobs being done,”*

For some beach locations proposed for clean-up, it was important to talk with the iwi liaison staff as there could be wāhi tapu (sacred places) or sensitive areas or people they needed to be aware of. Some of the interviewees concerns were;

*“It’s due to ignorance that they don’t know how we do things? Tikanga comes into it. Cultural differences, all those things”* (Wharepapa, 2013).

There was a strong view that the people were affected by the MV Rena oil spill. Communities west of Ōpōtiki were larger with diverse occupations and lifestyles, while residents of rural coastal communities from Te Kaha to Tihirau do not have the same lifestyles as was the concern made by Pook;

*“The Rena grounding brought an intrusion of our privacy, our domain. It was if no one really knew who we were or no one wanted to know that we even existed. We felt part of our mana, our whenua, our takutai moana (coastal shores) and our tūrangawaewae had been stripped from us”* (Pook, 2013).

As mentioned by Impact Assessment, Inc. (1990b, p.273), crews employed for clean-up duties by EVOS desecrated historical and archaeological sites and removed a skeleton from a burial cave. It was also stated that clean-up crews trespassed on community beaches and left garbage in the villages. Impact Assessment, Inc., reported racist comments were advertised;

“Many natives who were involved with the clean-up experienced racist comments over the marine radio about native women and lazy native workers,” (Impact Assessment, Inc. 1990b, p,278).

## Relationships

The oil spill disaster highlighted the fact that many of the social institutions and processes upon which communities rely for social cohesiveness and support were unreliable. A defining characteristic of these types of events is damage to community, to individuals, to ways of life, and to the world views that ascribe meaning to human experience (Shilnyk, 1985). Erikson (1985, cited in Shilnyk, 1985) states that communities and individuals feeling a long way from home will remain like refugees in their own land until the environment that was so vital to their sense of health and security is restored. Trauma from such events becomes compounded when community support systems become unavailable and are undermined. This then leads to a sense of chaos that contributes to unexpected outcomes and disruption in community life.

The oil, which spilled from the MV Rena affected the lives of many individuals residing in Te Whānau ā-Apanui rohe as well as those living away from the area;

*“I spoke to my wife, and said to her that I want to return home, my mountain is calling me home so that I may be caressed by the winds of home. Although I was in Auckland, my love for my home is very strong. And now, within two weeks I have returned home”* (Waititi, 2013).

The spill and related events generated social stress at all levels within the social structure, altering community activities, and relationships between individuals and groups within the communities. However, getting to know other people trying to help, did ease tensions in the East Coast communities.

As stated in the Rena Cultural Impact Report submitted by Whangaparāoa, Waihou Bay, Raukōkore and East Cape Region committee;

*“Locals, visitors, tourists, holiday makers who have camped in our area for years as well as DOC workers and Regional Council personnel. Everyone pulled together and gave of their best to restore our shores to what they were pre-Rena”* (Rena Cultural Impact Assessment report, East Cape Region, 2013).

## Communication

As stated earlier, *“recovery of communities whose lives have been disrupted and affected physically, socially, emotionally, culturally and economically by any type of disaster involves extensive and effective communication. The co-ordination of a number of different parties and these issues are advocated*



widely in both international and New Zealand based literature” (Becker, Saunders & Kerr; 2006). Interactions between communities and corporations during the clean-up according to McClintock, (1989) are described as mistrust, miscommunication, hostility, conflict and litigation (McClintock, 1989; Picou, Gill, and Cohen, 1997).

This is reflected in the comments made by one of the interviewees;

*Those ICC fellas, I never saw one of them. I never saw any, I don't know if Joe and they saw any. This is what I'm saying the only government agencies or agencies we saw was Tim, (BOPRC) the DOC staff and two Fire Service staff who had this big flash communications truck set up. That's the only fellas we saw” (Ngāmoki, 2013).*

People inherently want to help and feel involved in any action that affects their community-stops them feeling so helpless.

### Bureaucracy

A report in (Maritime New Zealand, 2011), stated that, “MNZ worked closely with local iwi to coordinate the clean-up.” Following the first meeting with Māori leaders, TPK and BOPRC iwi liaison, the Director of MNZ made engagement with iwi and hapū a priority in order to regain public confidence and support for MNZ, (Murdoch,2013). Mobilisation of iwi had been debated between the parties and a communications plan with iwi and hapū was worked out, which resulted in iwi utilising their local connections across 136 marae within the region to mobilise volunteers.

### Recovery

The people of Te Whānau ā-Apanui have repeatedly faced and repelled challenges in the past up to the present and it is exactly then that they display what is best their iwi. The next step now is about moving forward from response to recovery, and plans for restoration of the affected areas along the east coast of the Bay of Plenty region must come from the people of Te Whānau ā-Apanui. Comments made by the Rena Cultural Impact Assessment team was that they believed communities within Te Whānau ā-Apanui should not rely on outside agencies to provide rapid assistance in the event of an oil spill incident.

Relationships within affected communities depend on efficient and effective recovery processes and are achieved when the affected community exercises self-determination (Ministry of Civil Defence & Emergency Management, 2005).

Recovery recognises that Communities and individuals have a wide range of recovery needs and managing the recovery process as stated by Ministry of Civil Defence & Emergency Management, (2005) is best undertaken by those who personally understand their communities. Recovery of communities involves members of the communities who are supported by local, regional and national structures in ensuring the regeneration of functions, social structures and systems (Ministry of Civil Defence & Emergency Management, 2005).

### Conclusions

Experience from the EVOS and BP oil spills tells us that affected rural coastal communities are often disregarded by authorities. It cannot be stressed enough how the emotional, cultural, social, economic and physical well-being of those affected communities must be maintained throughout the response and recovery phases after an environmental disaster such as the MV Rena.

The effects of such a disaster are long lived within the community and every effort must be undertaken by the authorities to ensure that the mātauranga Māori and tikanga are respected. No one knows the local environment like the locals and their experience and understanding of the local environs are paramount to providing a supporting role to any disaster recovery programme.

There is no doubt that communication between all parties is the key to success, and provides a feeling of inclusion and empowerment to the affected communities, especially when the agency support ceases and communities are left to fend for themselves.

Affected communities are then able to put positive efforts forward rather than feel left out and isolated from decisions that will have a long-lasting effect on the place that they hold in such high regard.

An appropriate whakataukī from Ngāti Hine of Ngāpuhi to conclude;

"He pō kua moea	a night has been slept)
Ao ake anō ana	(comes the dawn)
Kei te hurahura te ata"	(the morning is unfolding)

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## Glossary

Ahi kā	People who keep the home fires burning
Atua	Gods
Hapū	Kinship group/pregnancy
Iwi	Extended kinship group/tribe
Kaimoana	Food of the sea
Kaitiaki	Guardian/caretaker
Kaitiakitanga	Stewardship
Karakia	Prayer
Kaumātua	Elderly gentleman
Kaupapa	Ground rules, purpose
Kaupapa Māori	Māori approach
Kawa	Custom
Mana	Power, prestige
Mana whenua	Authority over land/territory
Mātauranga Māori	Traditional knowledge
Mauri	Life force
Moana	Ocean, sea
Rangatiratanga	Sovereignty
Rohe	Region, area
Rūnanga	Iwi authority
Takutai	Sea coast
Tāngata whenua	Home people
Taonga	Treasure
Tapu	Sacred
Te Reo Māori	Māori language
Tikanga	Protocol
Tino rangatiratanga	Self determination
Tūrangawaewae	A place to stand
Utu	To repay
Wāhi tapu	Sacred place
Whakapapa	Genealogy
Whānau	Family
Whānaungatanga	Relationships



*Te Rangahau Taiao  
ki Awanuiārangi*

CHAPTER FIVE:

**PĀUA TO THE PEOPLE: CONTEMPORARY  
KAITIAKITANGA.**

*Warren, P.*



**PAUL WARREN**

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**Qualifications:** Master of Indigenous Studies, PG Cert Biological Sciences, BSc Environmental Science, Dip Marine Studies, Dive Instructor, Commercial Skipper

**Background:** Originally from London, England, Paul Warren has been living in the Bay of Plenty since 2003. Paul has always had a strong conservation ethos and had observed first-hand the tangible negative effects of urbanization and overfishing on local kaimoana, and was also aware of how abundant the local resources had been in the past. The grounding and subsequent oil spills from the MV Rena blackened his own home beach and really underlined to him and his family the issues that the environment was facing. He resolved to work hard for positive change in the local environment and was keen to incorporate traditional thinking in his methods.

Paul's research has focussed on building effective collaboration between Māori and non-Māori researchers and utilising techniques typically associated with western science as tools for kaupapa Māori research.

## Abstract

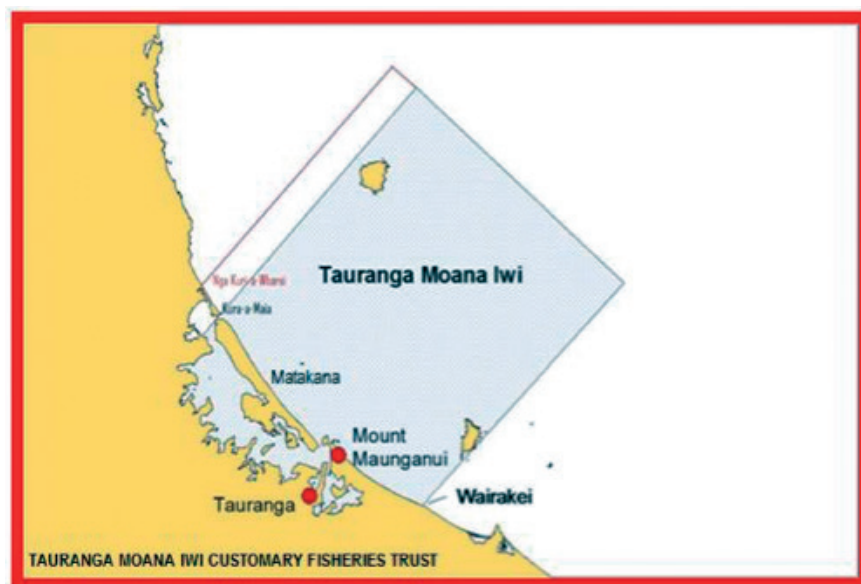
There have been several environmental and cultural impacts over the past few years due to the grounding of the MV Rena (2011) and the dredging plans for Tauranga Harbour. Consequently, the degradation of Tauranga Moana caused by the oil spill; the loss of shellfish, the pollution and sedimentation has impacted the mauri of the rohe and therefore is of great concern to tangata whenua. Kaitiaki knowledge and 2013/2014 subtidal surveys indicate a decline in pāua numbers in the Te Maunga o Mauao Mātaitai Marine Reserve and careful management of the pāua in Tauranga moana is necessary.

Therefore, this study outlines the development of a Kaupapa Māori research framework with a mātauranga Māori foundation that utilizes western science as a tool in relation to pāua enhancement in Te Maunga o Mauao Mātaitai. The viability of releasing hatchery raised juvenile pāua into Te Maunga o Mauao Mātaitai was investigated and the development of Ahumoana ā-Toi Pāua Hatchery at the Bay of Plenty Polytechnic. Research recommendations include broodstock development and an annual reseeding strategy utilizing students on the Marine Studies Diploma at BOPP.

## Introduction

*Tauranga Moana - Mai i Ngā Kurī ā-Whārei ki Wairākei?*

The borders of Tauranga Moana start at Bowentown, at the Harbour entrance, and stretch all the way to Pāpāmoa. Turning inland, they extend to the mountains Ōtawa and Ōtānewainuku, along the Kaimai Ranges and connect back to Bowentown (Black, 2012).



*Rohe Moana - Tauranga Moana (TMICFT, 2012)*

Tauranga Moana is therefore comprised of Te Awanui/Tauranga Harbour, a large number of rivers, streams and wetlands within the harbour catchment and the coastal marine area from the Nga Kurī ā-Whārei Stream in the north-west to the Wairākei Stream in the south-east. The rohe moana also includes 2 offshore islands, Tūhua to the north and Mōtītī to the southeast (TMICFT, 2012).

Tauranga Moana is a significant resource with environmental, conservation, cultural, economic, social and recreational values. Recognition of their mana, rangātiratanga and kaitiakitanga over the moana is fundamentally important to Tauranga Moana iwi and hapū who aspire to achieve the restoration, protection and maintenance of the health and wellbeing of the rohe. Ngāi Te Rangī, Ngāti Ranginui and Ngāti Pūkenga are the iwi of this district. Iwi and hapū of Tauranga Moana collectively work to provide a better future for their people while actively preserving the legacies of their ancestors.

Tangata whenua of Tauranga Moana regard their waters and Te Awanui as a sacred entity with its own mauri. This life-force is essential for its purity and life supporting qualities (Ellis, 2008). The waters of Tauranga Moana are a resource that supplies iwi with both food and spiritual wellbeing. Any activity that leads to degradation of this taonga is culturally unacceptable and therefore a major resource management issue. With the rapid economic growth and development in Tauranga, the pressure on natural resources is increasing rapidly. The preservation of wairuatanga with the natural environment and practice of kaitiakitanga in the face of commercial development is an ongoing challenge. Elders of Tauranga Moana iwi claim that there has been a dramatic reduction in fish and shellfish stocks within their lifetimes (Sinner, Clark, Ellis, Roberts, Jiang, Goodwin, Hale, Rolleston, Patterson, Hardy, Prouse, Brown, 2011).

Tauranga Moana Iwi Customary Fisheries Trust (TMICFT) operates on behalf of Ngāi Te Rangī, Ngāti Ranginui and Ngāti Pūkenga and uses a holistic approach to sustainable environmental management guided by ancestral values (Ellis & Kayes, 2013). The Trust facilitates iwi and kaitiaki working together to sustainably manage kaimoana in the rohe and is active in exploring future management concepts that will promote effective kaitiakitanga long term.

In 2006 TMICFT established the Te Maunga o Mauao Mātaitai reserve to achieve greater fisheries management control over recreational and customary harvesting. The reserve covers seven square kilometres of Tauranga moana which encompasses parts of Tauranga Harbour, the rocky shore around Mauao, Motuōtau and Moturiki (Ellis & Kayes, 2013). The area supports a diverse range of marine life which includes several taonga species; pāua, kuku, kina, pipi, pupu, koura are all found in this area. The area contained in the Mātaitai has been an important fishing ground for local iwi, hapū and whānau dating back to the 17th century, and still has great significance to tangata whenua for gathering of kaimoana. Protection and enhancement of the reserve is obviously a key priority of the Trust and the recent impact of the Rena and the planned dredging of the harbour have raised concerns over the health and sustainability of kaimoana stocks in the area.

### The Rena grounding

On the 5th October 2011, at 2:20 AM the container ship Rena ran aground on the Astrolabe Reef off the coast of Tauranga in New Zealand (Figure 2). Rena was transporting 1,368 containers, eight of which contained hazardous materials, as well as 1,700 tonnes of heavy fuel oil and 200 tonnes of marine diesel oil (Maritime NZ, 2012). Bad weather and rough sea conditions caused the ship to break up and by Sunday, 9 October 2011, a large oil slick was spreading on the water's surface. The size of the spill to date is approximately 350 tonnes (Rena Recovery, 2012).

The grounding of the Rena is the worst maritime environmental disaster to ever occur in New Zealand and has had both an environmental and cultural impact on Tauranga Moana. The spill impacted not only on marine life and people but also the coastal environment and the ecosystems within Tauranga Moana and beyond.



*MV Rena (Maritime NZ, 2012)*

### Port of Tauranga Dredging

On the 3rd of March 2013, the Minister for Conservation granted consent to the Port of Tauranga to undertake dredging operations to widen the shipping channels within Tauranga harbour. The dredging of the seabed within Tauranga Moana encroaches on some key areas of cultural significance, Te Paretaha, Panepane Point and Whareroa Marae. Te Paretaha holds a substantial pipi population and is a traditional harvesting spot. Dredging disturbance to the seabed can instantly cause mass mortalities in pipi bed areas and the on-going sedimentation and loss of habitat caused by the dredging will have continued effects on survival of the pipi. The sites where the dredged material will be dumped, confusingly named replenishment sites, are also next to environmentally important rocky reef areas such as Moturiki and Motuōtau which support a range of kaimoana species including pāua, kuku and kōura.

The cumulative impacts of both the Rena grounding and the consented dredging obviously have negative effects on the environment and therefore the mauri of Tauranga Moana. This has been recognised both in central and regional government legislation. The Rena long term environmental recovery plan put out by the New Zealand Government states on page 3 “Goal: Restore the mauri of the affected environment to its pre- Rena state” (Ministry for the Environment, 2011).

While the Bay of Plenty Regional Council resource consent granted for the Port dredging stipulated that a Kaimoana restoration plan (KRP) was to be implemented with the aid of TMICFT and funds of \$50,000 per annum allocated until the expiry of the consent in 2027 to facilitate the process of restoration.

The purpose of the KRP as set out in the consent is to mitigate the loss of kaimoana to Ngāi Te Rangi, Ngāti Ranginui and Ngāti Pūkenga and the identification of methods that ensure the ability of the affected tangata whenua to continue to collect kaimoana in these areas. This purpose directly relates to the ability of iwi and hapū to practise kaitiakitanga; to mitigate the impacts to Tauranga Moana and protect taonga species <sup>1</sup>.

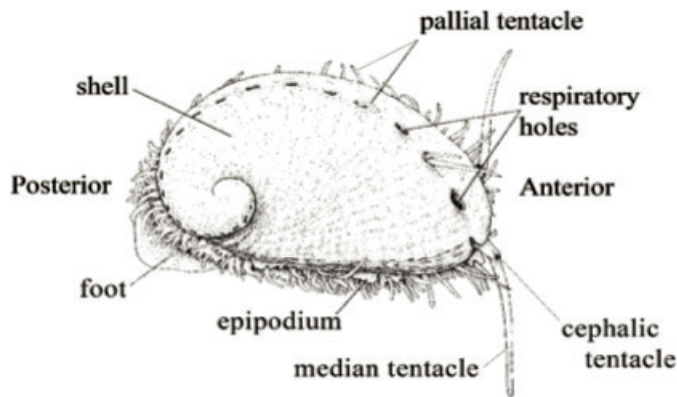
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1 Taonga species is a term used for species of flora or fauna that have cultural significance to Māori iwi or hapū.



The subject of the research is one such taonga species of Tauranga Moana, Pāua (*Haliotis iris*) (Kayes, Burke and Burke, 2013). Pāua are a marine gastropod. They are members of the phylum Mollusca, genera *Haliotis* and are also known as abalone. *Haliotis*, a Latin term, translates as sea ear, a description based on the shape of the pāua shell. New Zealand has 3 naturally occurring species of pāua, the black foot (*Haliotis iris*), the yellow foot (*Haliotis australis*) and the virgin or white foot (*Haliotis virginea*).

The black foot pāua is the largest of the three and subsequently the only species that is farmed in New Zealand. As it is an important commercial shellfish for New Zealand (Schiel, 1992) information on its reproductive biology and population dynamics is vital for managing natural stocks and establishing successful aquaculture ventures (Tong, 1982). Pāua have a low-profile shell that can reach up to 200mm in length (Cook, 2010). It is a large, loosely coiled shell perforated with a series of openings. These holes, termed foramina, are used for respiration. Oxygen rich water enters the holes at the front of the shell and flows over the gills. Waste products are carried out through the more posterior holes via the respiratory current. The foramina are also used for releasing sperm and eggs into the water column.



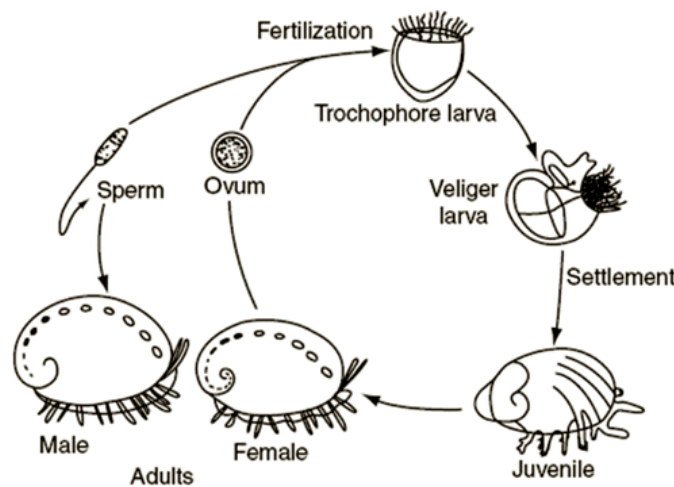
*Pāua anatomy (adapted from Tong & Moss, 1992)*

The outside of the Black foot pāua shell is usually encrusted with marine organisms but the inside is beautifully marked with iridescent green and blue patterns. The colour of the shell depends on the types of seaweed consumed by the animal (Leighton, 1966). Pāua are herbivorous browsers. They graze on marine algae in various ways according to their life stage. For example, tiny juvenile pāua (<5mm) will graze on microalgae such as benthic diatoms, other microscopic organisms and bacteria (Garland, Cooke Grant & McMeekin 1985; Hooker & Morse 1985; Norman-Boudreau, Burns, Cooke & Austin 1986). Black foot pāua are found all around the North and South Islands as well as the Chatham Islands, Stewart Island and Snares Islands (Sainsbury, 1982).

Pāua form large aggregations on rocky reefs and hard substrata ranging from the shallow intertidal down to 20 - 30m water depth (Lindberg, 1992; Blair, 2002; Degnan, Imron, Geiger & Degnan 2006). In general juveniles occupy the shallower areas less than 2m with adults found in slightly deeper areas down to 6m. (Poore, 1972a; Sainsbury, 1982; Shepherd & Turner, 1985; Schiel, 1993). Pāua are long lived but slow growing broadcast spawners (Poore, 1972b; Sainsbury, 1982;

Murray & Ackroyd, 1984). Growth rates vary significantly with limiting factors including food availability, water temperature, topography and wave exposure (McShane, Mercer & Naylor, 1994; McShane & Naylor, 1995).

The *H. iris* lifecycle has three key stages. They begin life as pelagic larvae which develop into cryptic juveniles and finally an emergent adult stage when they are sexually mature and aggregate together. Fertility increases with age and legal sized female pāua can release up to 11 million eggs in a season (Poore, 1973). When fertilized by the male's sperm, the eggs rapidly develop into free swimming larvae called trocophores.



*Pāua lifecycle (California Dept. of Fish and Game, 2014)*

High mortality rates are associated with the larval stage due to predation or failure to find suitable areas for settlement. Juvenile pāua are an easy meal for many species including starfish, crabs, rock lobster, blue cod, snapper and other reef fish. Only a small fraction of eggs released will survive (Blair, 2002).

Pāua have been important to the people of Aotearoa since the arrival of tangata whenua over 800 years ago. The lack of land mammals led to kaimoana and particularly pāua being a staple food for coastal Māori (Smith, 2011). As well as being a part of a traditional daily diet, pāua was important for manaakitanga ki ngā manuhiri, the hosting of visitors. The shell was used for decorative purposes and they were also dried and traded with inland tribes (Gibson, Ngāti Konohi, 2006).

The initial impacts on pāua by the arrival of Europeans were minor as Pākehā did not use them for food as an easily gathered bait for fishing (Johnson, 2004). Commercial harvests during the 1940's was purely for the iridescent shell (Schiel, 1992). A bleaching method for pāua meat was discovered in the 60's and this led to the export market and the beginning of commercial pāua diving (Brown, 1982). Commercial exploitation of pāua expanded during the 70's and 80's with large increases in prices and harvest. Stocks began to decline; the Wellington region was hit hard with pāua stocks close to a highly populated area. An export quota system was introduced in

1973 to try and restrict over harvesting (Moore, 1982).

By 1986 individual transferable quotas (ITQ) were in place and total allowable catch (TAC) was set for fisheries management areas all around New Zealand. Today the pāua fishery is a lucrative, commercial industry. In 2010 exports of black foot pāua were worth \$55 million dollars (Statistics New Zealand, 2010). The high value of pāua makes it subject to illegal fishing. The price paid for poached pāua is around \$20-30/kg for meat and \$8/kg for shell (Beaumont, 2008; Fox, 2011). In 2002 New Zealand's legal harvest of pāua was 1153 tonnes, the illegal production was approximately 400 tonnes (Haas, 2009).

Historically iwi and hapū had specific tikanga set out by kaumātua to aid the monitoring, care and harvest of pāua (Booth and Cox, 2003). Māori practiced fisheries enhancement as part of kaitiakitanga and the management of kaimoana. The obligations of kaitiakitanga included the duty of good care for marine resources with techniques such as transplanting stocks from one location to another to rebuild declining populations. Targeted fishing also controlled predators to allow shellfish to repopulate (Habib, 1989).

Māori place themselves as part of the natural environment and whakapapa (genealogy); land and the geographical features around them are key aspects to a person's identity. For Māori, the natural world is interrelated through whakapapa. People and all other living organisms on Earth share a connection to each other and the gods (Te Puni Kokiri, 1993). This relationship inherently fosters the need for sustainable management of resources and the need to avoid environmental degradation.

When considering an action or important project that needs to be addressed such as management of resources Māori are guided by rules and principles, known as kaupapa and tikanga. Tikanga Māori encompasses ethics, social control, law, economics, education and application of knowledge. Tika means 'to be right' and tikanga Māori provides rules of conduct and the correct way of living or being (Mead, 2003). This provides a framework for social interactions and defines how people identify themselves and how they interact with others.

However, as Aotearoa was colonised, a paradigm shift occurred. Māori kaupapa and tikanga were smothered by the dominant western paradigm which heavily impacted on their ability to practice kaitiakitanga. The creation of this cultural binary with Māori now on the outside having to live with a different world view led to disconnection from their culture for some. Confiscation of land and fisheries created further disconnection and severely impaired the ability of Māori to sustain resources for future generations. The philosophy of kaitiakitanga did not change but its practice became much more complex after colonisation.

In the last twenty years or so tikanga Māori has become more widely accepted with the focus on Māori control of their own knowledge afforded by processes such as the Waitangi Tribunal and the development of Kura Kaupapa Māori and wānanga. The term appears in legislation such as the Education Act 1989, the Resource Management Act (1991) and the Te Ture Whenua Māori Land Act 1993.

## The Resource Management Act and Māori

The purpose of the resource management act is to promote sustainable management of natural and physical resources. The Act acknowledges the principles of the Treaty of Waitangi<sup>2</sup> and specifies that matters of national importance must be recognised in its application. One of

<sup>2</sup> Tiriti o Waitangi, the Treaty of Waitangi is the founding document of New Zealand signed in 1840. Principles include: Kawanatanga, Rangatiratanga, Equality, Cooperation and Redress.

these matters of national importance is the recognition of the relationship of Māori to their ancestral lands and the provision of opportunity to practice these cultural traditions and value systems (Marsden, 1992). The Resource Management Act therefore lays down ground rules for management of natural resources that state the obligation to respect and provide for tikanga Māori (Marsden, 1992). Despite this tangata whenua have expressed legitimate concerns that government at local and national level has misunderstood and through ignorance of tikanga Māori ignored the Māori perspective.

To protect cultural values and taonga from development and environmental degradation it has become more important today that kaitiakitanga is practiced all the way down to sub-tribal and family levels. To increase the ability to exercise kaitiakitanga in the contemporary world tangata whenua values for resource management must be recognised and implemented by local governments.

Currently an increasing human population, coastal development and demand for fisheries products has put enormous pressure on the coastal marine environment. As wild fisheries have declined there has been growing interest in enhancement as a way of rebuilding stocks and increasing commercial production. Enhancement strategies can involve addition of new stock to supplement natural recruitment and the manipulation of the natural, physical environment to increase harvest. For example, aquaculture is carried out in a controlled (or semi-controlled) environment where a species is on-grown in captivity from an early life stage (Booth & Cox, 2003).

## Methodology

This research is conducted in collaboration with the Tauranga Moana Iwi Customary Fisheries Trust and investigates the viability of reseeded aquaculture hatchery raised pāua in Te Maunga o Mauao Mātaitai. Traditional knowledge, and customary management principles such as rāhui and mātaitai were applied in combination with a range of research methods to develop management of pāua populations in the local rohe. The project operated on a best practice level of 'relationship' as set out by Hudson, Milne, Reynolds, Russell & Smith (2010), where iwi and hapū acted as kaitiaki within the research project to ensure positive outcomes for Māori. This relationship was based on the whakataukī (proverb) "kia u ki te whakapono me te aroha tētahi ki tētahi" (hold fast to the truth with respect for each other, (Hudson et al, 2010).

Research project participants included; Ngāi Te Rangi, Ngāti Pūkenga and Ngāti Ranginui Tauranga Moana Iwi Customary Fisheries Trust (TMICFT), Te Whare Wānanga o Awanuiārangi (TWWOA) and the Bay of Plenty Polytechnic (BOPP).

The project was securely rooted in a Kaupapa Māori research foundation and incorporated Kaupapa Māori elements into quantitative and qualitative methods. The mahi is for Māori therefore it was important the research followed kaupapa Māori research methodologies. Kaupapa Māori research should be liberatory and aim to benefit the communities involved. It should acknowledge Māori aspirations for research while developing and implementing research methodologies and methods (Bishop, 1999).

The following Kaupapa Māori principles were applied throughout the project; aroha, kanohi kitea, manaaki tangata, mana, māhaki, and tikanga. Strong consultation with iwi and hapū and the inclusion of tikanga and cultural concepts occurred throughout the whole process. This involved discussion with kaumātua and kaitiaki on customary fishing areas through to karakia in both the laboratory and the field and direct involvement in the physical process of putting juvenile pāua into the area with iwi representatives out on the boat with researchers.

## Purpose of the Research

The guiding purpose of the study was to provide contemporary tools and strategies for effective practice of kaitiakitanga. A mixed methods approach was utilised to best answer the research questions. To address the first two questions, (1) What are the environmental parameters for survival and successful growth of hatchery raised juvenile pāua in the Mātaitai? and (2) How can we increase chances of survival? Qualitative and quantitative research methods were used. Initial consultation with kaumātua of participating iwi took place at TMICFT meetings during April/ May 2013.

Sites of historical significance for pāua within Te Maunga o Mauao Mātaitai and the surrounding waters of Tauranga Moana were discussed. This led to sharing of mātauranga from a client report prepared by Te Whare Wānanga o Awanuiārangi on taonga species in the Mātaitai (Kayes et al, 2013). This gave valuable information on pāua population numbers and sizes of individuals within the area.

A thorough literature review of pāua biology, commercial aquaculture husbandry and reseeded techniques gave insight in to how techniques could be adapted for a non-commercial pāua replenishment program and the steps required to implement a pāua reseeded program and establish a small-scale hatchery.

This was followed in 2013/2014 by a quantitative sub-tidal monitoring program that collected data in the following areas:

- Updated existing pāua population data to track any further decline/increase
- Classification of pāua habitat within the Mātaitai including analysis of aspect, exposure, habitat, algal presence and any other relevant conditions at historical sites.

The information gathered was used for statistical GIS analysis to produce a pāua database and high-resolution computer-generated map of the Mātaitai identifying all areas that exhibit the same conditions as the historically successful sites. This enabled selection of a network of optimal pāua reseeded sites within the Mātaitai.

A range of biological tests in the laboratory were also conducted to study the defensive behaviour of hatchery raised juveniles, to inform strategies to increase chances of survival in the wild once the reseeded took place.

## Part 1. Pāua Population Surveys

In 2013 Tauranga Moana Iwi Customary Fisheries Trust (TMICFT) commissioned a report by Te Whare Wānanga o Awanuiārangi (TWWOA). The purpose of the report was to provide spatial and ecological data on customary taonga species in the Te Maunga o Mauao Mātaitai Reserve. During March and April 2013 Burke & Burke of MUSA Dive Environmental Marine Consultants conducted baseline surveys on Kina (*Evechinus chloroticus*), Kūtai (*Perna canaliculus*, green lipped mussel), Pupu (*Turbo smaragdus*, Cat's eye) and Pāua (*Haliotis iris*) within the reserve.

Through focus group interviews, the researchers also drew on traditional knowledge; and the areas surveyed were identified by iwi representatives as being customary sites of significance (Kayes et al, 2013). These sites were then projected into the WGS84 GPS system to enable the replication of the quantitative baseline surveys undertaken. It was the first replication of ongoing annual monitoring of kaimoana stocks in the Mātaitai driven by TMICFT. The data collected for this report served several purposes, firstly it updated the 2013 data on pāua

distribution, population density and size frequency. Secondly the data collected informed the pāua enhancement program.

During September - October 2014 sub-tidal monitoring of pāua in Te Maunga o Mauao Mātaitai reserve was undertaken. The 34 sites established by Kayes et al, (2013) were located using GPS and the same methodology was applied. To maximize efficiency when conditions were good teams of Bay of Plenty Polytechnic (BOPP) Marine Studies divers were used so multiple sites could be surveyed at the same time. Ten-minute timed counts as described by Andrew, Gerring & Naylor (2000) were utilized. Two divers were dropped at GPS locations. The time taken to find the first pāua was recorded from which the 10-minute count began. If possible pāua were undisturbed and measured in situ. Alternatively, pāua were carefully removed with a blunt pāua tool to avoid damage. Each pāua was then measured with a steel rule along the length of the shell and returned to original position. If no pāua were found within 10 minutes a nil count was recorded. Maximum depth, substrate type and algal presence were also recorded. When the 10-minute count was up 10 pāua were randomly selected for gonad inspection to ascertain sexual maturity and gonad development.

Traditionally pāua were only found in any numbers on the northwestern aspect of Mauao where the swell begins to influence the rocky shore. The Northeastern aspect of Motuōtau was traditionally the most abundant in pāua with larger sizes than Mauao (T. Piahana, personal communication, April 10th, 2013).

The results of the 2013 (Kayes et al, 2013) and 2014 surveys confirm this pattern with pāua numbers increasing as divers moved into these areas. These areas are exposed headlands with plentiful boulder and smaller rock substrate for pāua to hide and feed. It is well documented that areas with good water movement where drift seaweed can accumulate are preferable to pāua with aggregations clustering in the sublittoral zone on open, exposed coasts (Poore, 1972; Sainsbury, 1982; Shepherd & Turner, 1985; Schiel, 1993; Heath, 2013). The 14 legal-take size pāua (125mm+) in the 2014 survey were all found in the more exposed areas of the Mātaitai.

McShane & Naylor (1995) compared growth rates of pāua in sheltered bays and exposed headlands in a tag, recapture study. They found significantly higher growth rates and size in exposed areas compared to sheltered bays. This variation was on a small scale with headlands and bays less than 200m apart. They also found that pāua in exposed areas reached sexual maturity at a smaller size than in sheltered bays. Results of the 2013/2014 surveys reflect the variation described by McShane & Naylor (1995).

This information is particularly useful for TMICFT for successful design and implementation of management programs such as the local hatchery and enhancement planned. Identifying locations of larger pāua allows for careful collection of brood stock. Locating sites with optimal conditions for juvenile pāua considering factors such as food availability (algal presence), exposure and substrate will aid the selection of a network of sites for enhancement (reseeding) that will be suitably close to each other.

Kaumātua expressed concerns as to whether the types of algae present in the Mātaitai were the preferred species for pāua therefore the dominant algal species present at the sites were also surveyed within the Mātaitai. The sites within the Mātaitai that were the most abundant with pāua held a diverse range of seaweeds compared to less abundant sites that typically had only 1 or 2 species of algae. Abundant pāua sites had a mixture of brown and red seaweeds which potentially caters to all life-stages of pāua. In the 2014 survey sites with substrates such as boulders, smaller rocks and cobbles had the highest number of pāua. Estes, Lindberg and



Wray (2005) identified that these habitats with many cracks and crevices allow the greatest accumulation of macro algae for the sedentary adult pāua to feed on.

Pāua numbers dropped in the 2014 survey as divers moved further into Te Awanui. These sites were more sheltered with higher sediment loading. Only 3 pāua were found in areas with sand and shell debris present. This information builds on the knowledge base of optimal pāua habitats in the Mātaitai and will be considered when planning enhancement in the area.

Comparing abundance between the 2013 and 2014 surveys suggests a large decline in numbers with a total of 1205 pāua counted in 2013 dropping to 534 in 2014. This is an alarming 65% loss. The amount of pāua recorded on each survey dive also dropped from 2013 to 2014. The mean frequency of pāua recorded per 10-minute count at sites around Mauao in 2014 was 20.5 + 6.2 CI compared to 34 pāua + 11.9 CI in 2013. At the 4 sites around Motuōtau in 2014 the mean frequency per ten-minute count was 20.5 + 19.2 CI, less than the 2013 mean frequency of 80.3 pāua + 72.4 CI per 10-minute count.

Although concerning the result is heavily influenced by the methods utilized. For example, in the 2013 survey an experienced professional pāua diver was used to collect pāua data compared to a team of experienced divers trained in sub tidal monitoring of pāua in 2014. Only size class data was collected in the 2013 survey whereas divers in 2014 were taking precise measurements and divers reported large numbers of pāua remaining unmeasured or accounted for at the end of the 10-minute count. Dispersal of aggregations may also be a confounding factor when using fixed point survey sites. Andrew et al (2000) found that pāua moved considerable distances within their study area. These factors are the reason for the highly reduced number of pāua per count in 2014.

It is the desire of TMICFT that monitoring of the pāua populations in the Mātaitai be an ongoing annual program. Staff (including the author) and students of BOPP can facilitate this. Going forward there are different options for an annual survey. Access to teams of divers means that a more detailed transect method as described by Garnett and Tuimaseve (2006) could be achieved. This would allow for more robust analysis of pāua population density and biomass.

## Part 2. Pāua Enhancement in Te Maunga O Mauao Mātaitai, A Case Study

The complete lack of juvenile pāua found in the 2013/2014 surveys suggested poor recruitment to the area and highlighted the need for careful management of this taonga species. Successful reseeded projects and research on pāua to date, indicate that wild populations can be restocked with hatchery raised juvenile seed if optimal habitat and conditions are found (Dickson, Day, Hutchette, & Shephard, S., 2006; Goodsell, Underwood, Chapman, & Heasman, 2008).

Therefore, this project tested the viability of reseeded farmed pāua with a pilot study releasing a small amount of hatchery raised seed into a series of experimental treatments in the wild. A total of 2000 juvenile pāua between 15 and 25mm in shell length were expected to be released at 5 sites ranging from exposed headland to more sheltered areas. The aim of these experiments was to define optimal habitat in the Mātaitai and establish the level of predator exclusion required for successful reseeded. This information could then be used in larger reseeded programs in the future.

The island of Motuōtau was selected as being a traditional source of pāua while being further offshore than other pāua areas in the Mātaitai. It was hoped this would afford the project slightly more protection from human interference. The aim of the pāua reseeded program in the mātaitai was to maintain genetic diversity within and between the wild and introduced populations. This

would serve to maintain physiological fitness, adaptability, diversity and survival of the pāua population and maintain the ecological balance of the marine environment in Tauranga Moana.

However, there were several problems with the supply of the 2000 juvenile pāua. After a series of events including; delayed histology reporting and technical difficulties with the supplier's ultraviolet filtration system the juvenile pāua became infected with *Perkinsus olseni*, a disease caused by two different dinoflagellate-like pathogens.

As a result, no pāua could be supplied. To keep the project moving forward in its goal of replenishing pāua stocks in it was proposed that a small scale pāua hatchery be set up at the Bay of Plenty Polytechnic's aquaculture facility, Ahumoana ā-Toi, to eventually supply the reseeded project. Brood stock could be collected from Tauranga Moana and spawning induced in the laboratory to produce the required seed. These would be on-grown to the size required for release.

Commercial production of pāua has developed considerably since its initiation in Japan in the 1960's. In the last 20 years farms and hatcheries have been established all over the world and culture techniques vary between countries and farms (Hahn, 1989). The principles of pāua rearing include; broodstock management, spawning, larval rearing, settlement and on-growing to desired size. Local pāua populations vary in their ability to spawn from year to year and the spawning season for northern New Zealand is not defined (Poore, 1973; Sainsbury, 1982). It was therefore decided that regular, monthly monitoring of gonad development in the local population would provide location of viable broodstock for collection and immediate use. Supplementary to this, adult pāua are also now held at Ahumoana ā-Toi for conditioning to try and ensure reliable production. Once broodstock have been used it is preferred that they are returned to the wild.

When gonads are ripe pāua will spawn readily in laboratory conditions. Spawning can be induced by immersion in seawater containing a hydrogen peroxide/sodium hydroxide solution (Morse, Hooker, Duncan & Jensen 1979). Temperature shock and UV irradiated water have also been used to spawn abalone (Kikuchi and Uki, 1974; Hahn, 1989). It was proposed that Ahumoana ā-Toi hatchery use chemical stimulus as this is cheaper and more reliable than other methods (Tong, Moss, Redfern & Illingworth, 1992).

At Ahumoana ā-Toi after spawning had occurred larvae would be transferred from the hatching tank into two 160l conical larval rearing tanks. Excellent water quality is critical at this stage. Bacteria can multiply at increased rates in tank systems which can be lethal for mollusc larvae (Lewis, Garland, O'Brien, Fraser, Tong, Ward, Dix & McMeekin 1988). To ensure good water quality, rigorous filtration has been applied to a batch culture system where water is changed daily. Fresh seawater from the main storage tanks is pumped into the 200l cylindrical larval rearing storage tank through a 1-micron filter and 11W UV sterilization unit. The water is held here overnight to reach ambient temperature.

Criteria have been established to determine when pāua larvae are ready to settle. These include 4 buds on the cephalic tentacles, the ability to crawl on a surface and 5-6 rows of teeth on the radula, although post larval survival improved when larvae settled with 10-12 rows of teeth (Seki and Kan-no, 1977; Tong & Moss, 1992). To settle successfully, larvae require a suitable surface with a food source. At Ahumoana ā-Toi larvae will be transferred when ready to an 800l recirculating, settlement and growth tank. At between 8-10 weeks the first respiratory hole should appear and the pāua will have reached around 2-3mm shell length. Once juveniles attain 5mm in shell length they can be weaned onto a macro algae diet by adding small amounts of brown and red seaweed.

It is expected that there will be variation in growth rates with any batch of pāua produced. Results from this study and the work on reseeded by Keys (2005) suggest an optimal size for reseeded at 15-20mm shell length. In the wild pāua can grow up to approximately 20mm in a year (Sainsbury, 1982; Blair, 2002). Juvenile pāua produced at Ahumoana ā-Toi will be closely monitored for growth and the success of diet combinations investigated. The aim of the project is to produce 2000 healthy juvenile pāua for release at 15-20mm shell length on a 12-18month rotation.

### Part 3. Defensive Behaviour Of Farmed Juvenile Pāua

Dramatic declines in *Haliotis* spp. fisheries have been documented all over the world. The release of farmed juveniles into natural habitats has been considered as one solution to enhancing wild stocks and bringing fisheries back from the brink of near collapse (Hamasaki & Kitada, 2008). There is evidence that predation and stress associated with travel and handling can cause mortalities in juvenile seed released into the wild (McCormick, Herbinson, Mill & Altick 1994; Ebert & Ebert, 1988). Hatchery raised juveniles may also be more susceptible to predation taking longer to clamp down or hide in crevices to avoid predators than wild juveniles (Schiel and Welden, 1987).

This research component investigates farm-reared juvenile pāua behaviour and describes potential acclimatization techniques to be applied when introducing hatchery-raised juveniles into to a natural environment. The behaviour observed provides further understanding of hatchery-reared pāua and specific behaviours that may influence and increase reseeded success are noted.

Through the experiment it appears that hatchery raised juveniles do not have the same predator response mechanisms as wild pāua. There was little reaction or difference in behaviour when predators were introduced to the systems. It could be argued that dormancy is their primary defence mechanism with juveniles clamping down to protect themselves. However juvenile pāua at the sizes tested were relatively easy to dislodge from the bottom, and would have been by the predators introduced if allowed access. After a prolonged exposure (20 minutes) it was expected that the juvenile pāua would attempt to move away from the predator seeking a hiding place. This was generally not the case with some individuals actually moving closer to the predator.

Sea stars secrete pheromones, chemicals that trigger a specific response in many of its prey species. Many studies have been conducted in response to chemical cues omitted into the water column providing a warning alarm to potential prey (Lawrence, 2013). Personal observations of wild adult pāua showed an immediate clamping down when a sea star was placed in proximity. There appeared to be no response at all by juvenile pāua during tests with the Eleven-armed sea star (*Coscinasterias calamaria*), a well-known predator of New Zealand wild populations. The Red rock crab (*Plagusia chabrus*), also a voracious predator of local wild populations also appeared to be ignored.

The lack of response to predators may indicate that clamping down to the substrate may be a learned behavior for juvenile pāua and lacking in farmed juveniles raised in artificial predator free conditions. Although dormancy was the most common behavior exhibited, the farmed juveniles also continued to actively move around with some individuals even making their way towards the predator exclusion cage during the 20 minutes of testing. Little notice was given to the presence of predators with several juveniles moving towards and settling in very close proximity to the containment device while the predator inside was actively trying to escape.

Mortality rates of wild and farmed pāua in a natural environment were compared by Schiel & Welden (1987). They found that predators consumed more hatchery reared juveniles such as sea stars, crabs and lobsters, than wild raised juveniles. Observations were that most hatchery-raised individuals were slower in response to predators at first but could acclimate to new environments over a short timeframe.

Turnover rates of farmed juvenile pāua in relation to size and weight were tested during this study. This was to ascertain if juveniles could quickly switch from a prone to protected position after dislodgement. In the natural environment dislodgement could occur through wave action or predator interference. The ability to 'turnover' quickly to a facedown 'secure' position after being dislodged from the substrate may be a critical factor for survival of farmed juvenile pāua, providing protection from predators in a natural environment.

Of the size range tested, the medium-sized pāua were found to have the fastest turnover rates. This suggests an optimum size range for reseeding would be 15-24mm shell length, given these sized individuals appear to have the fastest reaction time. Farmed juveniles were far more active in warmer water temperatures (17°C) than cooler temperatures (14°C) during testing. Reseeding projects may be more successful during winter as juveniles may be more likely to remain within transportation devices or predator exclusion cages in cooler waters for a longer period while acclimatization takes place.

#### Part 4. GIS Pāua Habitat Modelling

Consultation with Kaumātua and Kaitiaki of Tauranga Moana in 2013 identified traditional sites for gathering of pāua in Te Maunga O Mauao Mātaitai reserve. Over many years kaitiaki of the area have established patterns of pāua distribution throughout the area that is now the Mātaitai (P. Borell, personal communication, April 10th, 2013). Traditionally pāua were only found in any numbers on the northwestern aspect of Mauao where the swell begins to influence the rocky shore. The Northeastern aspect of Motuōtau was traditionally the most abundant in pāua with larger sizes than Mauao (T. Piahana, personal communication, April 10th, 2013).

Successful spawning and recruitment of pāua is related to the number and size of spawning animals in aggregations. The small sizes and lower numbers of pāua aggregations in the Mātaitai may have brought the population below the minimum threshold for spawning success.

Therefore, to enhance pāua populations in Te Maunga o Mauao Mātaitai, the Tauranga Moana Customary Fisheries Trust has initiated a reseeding program to introduce farmed juvenile pāua into the wild population. Critical to this is the selection of optimal habitat. It was decided to establish areas with optimal habitat throughout the entire Mātaitai. To do this ArcGIS10.1, a Geographical Information System (GIS) software package has been used to incorporate and extrapolate traditional knowledge within a digital database to create detailed optimal pāua habitat maps of the Mātaitai area.

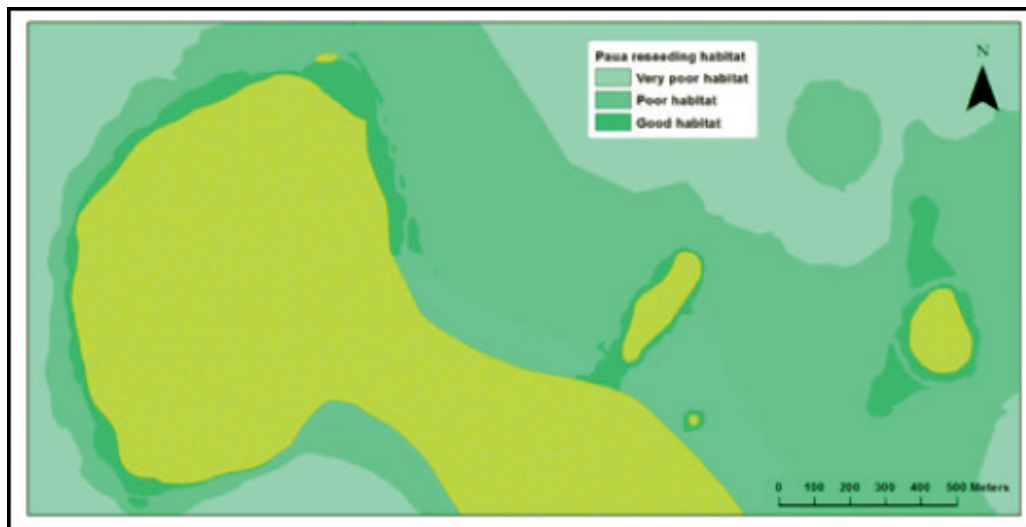
GIS can provide a powerful platform for predictive habitat modelling combining geography and statistics (Palmeirim, 1988). GIS and remote-sensing tools combined with ecological theory and scientific procedures can translate diverse information into a more manageable outcome (Breman, 2002).

The real benefit of using a GIS model is that multiple spatial data layers describing geographical features such as terrain and bathymetry can be quickly processed to generate ecology based test data to assess the key factors in animal abundance (Martin, Brabyn & Potter, 2011).

Locating suitable marine habitat for pāua requires consideration of various environmental factors. GIS and remote sensing tools were utilised in conjunction with ecological theory and sub-tidal monitoring data to produce a manageable model. Mātauranga Māori in the form of pāua gathering boundaries described by Kaumātua and Kaitiaki were defined by GPS location and converted into a spatial data shapefile. Knowledge of the conditions in these areas was used to identify key variables for selection of optimal habitat sites.

The pāua abundance data from the 2013/2014 subtidal surveys in the Mātaitai were also entered into the GIS database. High resolution satellite images were used to classify substrate and algal cover in the Mātaitai.

An optimal juvenile pāua habitat model with flexible environmental and biological analysis functionality was generated. This includes a predicted probability surface for pāua presence. The model generated can be used to pinpoint suitable locations for a network of juvenile pāua reseedling sites within the Mātaitai but this process could also be used in other areas of Tauranga Moana with different Taonga species. This type of analysis may help to inform customary fisheries management and conservation strategies. It also provides a cheaper, less time consuming option to sub-tidal surveying.



*Predicted probability surface for optimal pāua habitat*

## Discussion

Aotearoa has the fourth largest Exclusive Economic Zone in the world (Mansfield, 2012) and its coastal marine areas are the least understood of all habitats in New Zealand (Moller, 2009). With such a deficit, all forms of knowledge on sustainable management of these ecosystems must be harnessed. This includes both ‘western’ and indigenous knowledge systems, working together to promote positive change and restoration (Hardy, Patterson, Smith & Spinks, 2011).

Successful partnership of science and Mātauranga Māori could build a successful framework for management of New Zealand’s environment but colonisation and the total assimilation of western values across the country in recent history has created a barrier to shared dialogue.

This study has taken a multi layered approach to an environmental management issue. The sustainable management of kaimoana species within Tauranga Moana is being addressed by

the Tauranga Iwi Customary Fisheries Trust that represents hapū from Ngāi Te Rangī, Ngāti Ranginui and Ngāti Pūkenga.

The 2013/2014 subtidal surveys of the pāua populations of Te Maunga o Mauao Mātaitai described in this study indicate declining numbers. The complete lack of juvenile pāua found suggests poor recruitment to the area. The small sizes and lower numbers of pāua aggregations in the Mātaitai may have brought the population below the minimum threshold for spawning success. All this knowledge has driven the development of the pāua enhancement program and the creation of Ahumoana ā-Toi pāua hatchery.

Both initiatives seek to address the increasing inability of iwi and hapū of Tauranga Moana to practice their cultural obligations. The reseedling of farmed juvenile pāua into the reserve has the potential to enhance the numbers of pāua available for harvesting in Tauranga Moana. Protection of this taonga species using a variety of strategies that combine western science and mātauranga Māori demonstrates the adaptability of contemporary kaitiakitanga.

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## Glossary

Aotearoa	New Zealand
Aroha	Love
Hapū	Sub-tribe
Iwi	Tribe
Kaimoana	Food of the sea
Kaitiaki	Guardian
Kaitiakitanga	Guardianship
Kanohi kitea	The seen face
Karakia	Prayer
Kaumātua	Elderly person
Kaupapa	Purpose
Kaupapa Māori	Māori approach
Kura	School
Māhaki	Inoffensive
Mahi	Work
Mana	Prestige
Manaakitanga	Hospitality
Manuhiri	Visitors
Māori	Native or belonging to New Zealand
Mātauranga	Knowledge
Mauri	Life force
Moana	Ocean
Rāhui	to ban or restrict
Rangatiratanga	Self determination
Rohe	Area
Tangata whenua	Indigenous people - of the land
Taonga	Treasure
Tika	Right
Tikanga	Rules
Wairuatanga	Spirituality
Wānanga	Forum to meet and discuss
Whakataukī	Proverb
Whakapapa	Ancestry
Whānau	Family
Whare wānanga	Learning house



*Te Rangahau Taiao  
ki Awanuiārangi*

CHAPTER SIX:

**WETLANDS & WATERWAYS THROUGH A  
WEAVER'S LENS.**

*Takuira, T. (2016).*



Ko Ko Matawhaura te maunga  
Ko Rotoiti te awa  
Ko Te Arawa, Mataatua, ngā waka  
Ko Te Arawa, Ngāti Awa, Ngāi Tūhoe ngā iwi  
Ko **TRACEY TAKUIRA** ahau

**Work:** Doctor of Philosophy Candidate

**Title:** Raranga and Plants Research Fellow

**Quals:** Masters of Indigenous Studies (Hons), BA  
Māori Visual Arts, Kairaranga

**Background:** Best known for her intricate traditional raranga (weaving) style, Tracey utilises many indigenous natural fibres of Aotearoa in her art forms. As a raranga artist, her diversity does not limit herself to harakeke alone. By integrating different plants in her creative practice, she is able to embrace the personality and character of each individual fibre to tell her stories.

Currently working towards her PhD, majoring in Environmental Studies at Te Wānanga o Awanuiārangi, Takuira's work explores the correlation between mankind and their effect on the surrounding environment.

## Abstract

This research explores kaitiakitanga through a weaver's lens to emphasize why nurturing, restoring, and sustaining our waterways and wetlands are important as well as significant to us as Māori. The kaupapa of the research relates to the whakapapa, whānau and whenua of Pukehina M 1 Block which is situated on the coastline of the Bay of Plenty between Maketū and Otama-rākau. Mātauranga Māori is interwoven throughout the research employing several research methods; raranga as an arts-based research, pūrākau, interviews, field study and document collection. This research is both empowering and uplifting as it focuses on knowledge of whakapapa, whānau and whenua. This study is for our tamariki and mokopuna and future generations to know who and where they come from.

## Introduction

The land, plants, birds, fish and water have always been culturally and environmentally important to Māori, as taonga tuku iho; ngā tūpuna. Across generations Māori have seen themselves as guardians who nurture and care for the land; land which was a gift from Io Matua and was to be passed to future generations (Miller, 2011, p. 147). This gift includes waterways, wet lands and customary plants. These taonga tuku iho need to be sustained, or they will be lost forever in this ever-developing economic environment of today (Department of Conservation, 2013).

Taonga tuku iho around mātauranga Māori or Māori knowledge associated with our natural resources needs to be remembered. Wiri (2001, p. 26), defines mātauranga Māori as; "Māori epistemology; the Māori way of knowing, the Māori world view; the Māori style of thought; Māori ideology; Māori knowledge base; Māori perspective; to fully understand the Māori world; to be knowledgeable in things Māori; to be a graduate of the Māori schools of learning (whare wānanga); Māori tradition and history; Māori experience of certain phenomena; Māori enlightenment; Māori scholarship; Māori intellectual tradition".

The research reveals how as a Māori wahine weaver and conservationist utilises mātauranga Māori and raranga (weaving) to explore not only the taonga species/customary plants and their uses, but also the environment in which they inhabit. Taonga species or customary materials such as Kuta/Paopao (*Eleocharis sphacelata*), Harakeke (*Phormium tenax*), and Pīngao (*Desmoschoenus spiralis*), (Scheele, 2010a, Herbert, & Oliphant, 1991) as well as many more natural resources, are significant to the cultural identity of Māori people.

Cultural significant plants are important for not only traditional arts and crafts, but for customary food preparation and herbal remedies (Ministry of Environment, 1997). The necessity to sustain culturally significant resources is recognized in Aotearoa's environmental legislation.

*"the exercise of kaitiaki responsibilities towards these taonga species and their environment, is a fundamental aspect of Māori culture, and kaitiaki relationships are important sources of identity" (Waitangi Tribunal, 2011).*

The challenge therefore is to develop a management regimes' that will safeguard cultural use rights and traditional knowledge, while also maintaining the plants for their intrinsic and ecological values, for the benefit of society in general (Ministry of Environment, 1997; Te Whiti Love, Kruger, Tutua-Nathan, & Barns, 1993; Waitangi Tribunal, 2011).

There are six taonga species relevant to this study including Kuta (*E.sphacelata*), Harakeke (*P. tenax*) New Zealand Flax, Pīngao (*D. spiralis*), Tī kōuka (*Cordyline australis*), Raupō (*Typha orientalis*), and Toetoe Kākaho (*Cortaderia toetoe*).

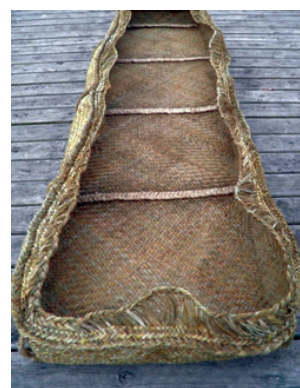
**Kuta** (*E. sphacelata*) is a water reed that grows in fresh water lakes and tolerates deep water situations where there is neither photosynthesis occurring nor any oxygen available to enable growth. It forms rhizomes bearing densely packed bright green or yellow green stems that emerge one and a half metres above the lake surface and grow to a maximum depth of three metres under the water and then it stops. The plants tendency to dominate deep-water margins makes kuta crucial to the ecology of this habitat as a source of food, shelter and protection for birds, fish and invertebrate (Kapa, 2009).

**Kuta** (*E. sphacelata*) was historically used for whāriki (mats) to sleep for they proved warm and soft to the skin. Pake (rain capes) were also important clothing for shelter and warmth, however, in contemporary times of today kuta is utilized more in contemporary wearable art. With more and more pressures coming onto the water bodies that kuta is prevalent in, the greatest impacts on the water is caused by pollution from agricultural farming practices, avocado and other orchards, through forestry run off, septic tanks, water running off roads and now draining of wetlands for buried kauri stumps (Stone, 2015). "To preserve kuta as a weaving resource then we have to preserve our lakes. I would put it around the other way, preserve our lakes, and you've got nothing to worry about. Kuta breathes life into our water bodies, into the wai" (Matthews, pers comm; 2013).

**Harakeke** (*P. tenax*) New Zealand Flax is abundant throughout New Zealand, and grows anywhere from sea level to 1300 metres in altitude. According to Scheele (2010a), "The two native species peculiar to Aotearoa are of the lily family - Phormium tenax and Phormium cookianum", and of these species "there are some 60 varieties". In the past, Māori of old were able to identify the different qualities and strengths of each, for example, "kōhunga is black edged and good quality muka" (Puketapu-Hetet, 1999).



Harakeke outside drying. Image: Tracey Takuira, 2014



Harakeke waha tūpapaku. Artist: Tracey Takuira, 2014.

Black edged harakeke bushes are sought after by weavers for its high fibre content in the leaves and which a kuku (mussel shell) is used to extract the muka (fibre) from the plant (Te Kanawa, 1992). Extraction of muka was not only employed to make protective and warm clothing but also prestigious outer garments, as well as tools for hunting and nets for fishing. Upon sighting the intricate outer garments of the early Māori, during the European colonization, harakeke became a valuable trading material, which at times employed whole communities becoming involved with its production (Puketapu-Hetet, 1999, Stafford, 1986).

Today, "harakeke is often seen in gardens, as well as landscape projects and more recently as wetland restoration plantings" (Scheele, 2010). Puketapu-Hetet (1999, p. 11) relates the many

uses of the different parts of the harakeke plant. For example, "The take (hard base of a flax leaf) can be split through to make a child's toy clacker, and the dry korari (flower stalk) were used to teach taiaha (weapon) drill as it is light and easily twirled, as well as lashing bundles of korari together with harakeke strips also made toy boats, or used as floatation device to support yourself in water".

**Pīngao** (*D. spiralis*) is a native plant that only grows on coastal sand dunes in Aotearoa, and is not found anywhere else in the world. The natural function of pīngao is, it's a sand dune builder and sand binder. Once harvested and hung to dry the status of the pīngao is elevated due to its natural brilliant orange-gold colour which cannot be improved upon.



*Pīngao growing below Waiheke pā.  
Image: Tracey Takuira, 2014.*



*Pīngao Bodice and skirt.  
Artist: Tracey Takuira, 2010.*

Māori employed the brilliant gold colour of pīngao into traditional tukutuku panels which also incorporated kiekie and harakeke attached to kākaho (Puketapu-Hetet, 1999). Traditional and contemporary weavers today value pīngao for weaving whāriki, pake, kete, pōtae, as well as wearable art (Puketapu-Hetet, 1999).

The cultural, spiritual and traditional significance to Māori people are behind the drive in efforts to maintain and nurture this valuable plant. This is necessary because today pīngao has declined dramatically in growth due to invasive activity from population growth, stock, rodents, introduced plants such as the aggressive sand-binder marram grass, tree lupin and coastal erosion (Scheele, 2010b). Weavers stress the need to be kaitiaki for these endangered resources by protecting the natural environment (Herbert and Oliphant, 1991), and fortunately pīngao can be grown from seed and transplanted by cuttings (Scheele, 2010b).

**Tī kōuka** (*C. australis*, *cabbage tree*) are a familiar and distinctive feature of Aotearoa landscape. They grow all over the country, but prefer wet, open areas like swampy wetlands, and are often a feature of farmland as a result of their resilience out in the open (Scheele, 2010c). According to Simpson (2000), "The tree was well known to Māori before its scientific discovery".

Traditionally, the tī kōuka (cabbage tree) was an important food source for Māori, for example kōata (part of the stem) was broken and cooked to form kōuka, a food similar to an artichoke heart (Simpson, 2000). Also, the root, stem and top are edible, and are a good source of starch and sugar. As a medicine, tī kōuka was also made into tea to cure diarrhea and dysentery (Department of Conservation, 2006).



In the past fishing nets made from harakeke were strengthened by plaiting tī kōuka fibrous leaves together as runners, as the tī kōuka fibre was much more tougher and stronger. In fishing, tī kōuka was useful as anchor ropes as the fibre did not shrink in water (Simpson, 2000), also in making snares to capture birds, as their leaves were durable and kept their shape well. Still today, although not used so often by weavers it is still valued for its toughness and durability" (Scheele, 2010c).



*Tī kōuka, Pukehina.*  
Image: Tracey Takuira, 2014.



*Tī kōuka kete housing a young plant.*  
Artist: Tracey Takuira, 2015.

**Raupō** (*T. orientalis*) more commonly known as bullrush, is a water reed, and grows to a height of up to 4 metres. Raupō inhabits not only shallow fertile waters, but also up to depths of 1.5 metre water-logged soils in and around sheltered lakes, ponds or seepages. Since the draining of 80 % of wetlands in the past 150 years, there has been a marked decline in the abundance of raupō (Scheele & Sweetapple, 2010).

Historically, Māori utilized every part of the raupō plant (Hiroa, 1977). In housing, raupō stalks were used in walls and rooves of whares and storehouses as thatching, and the down was used to stuff bedding. The leaves were used for waka (canoe) sails and manu aute (kites), while bundles of stalks made temporary rafts. The raupō roots or starchy rhizomes were an important food source, and the yellow pollen was gathered and baked into a sweet light cake (Hiroa, 1977, Scheele & Sweetapple, 2010).

To the Māori the existence of a raupō swamp within convenient distance of his home was a necessity of life, a source of food and building material. "Today, dense productive stands enable raupō to be an effective water purifier. Along with other aquatic species, raupō is being used in constructed wetlands, built specifically for water purification purposes" (Scheele & Sweetwater 2010).

**Toetoe Kākaho** (*C. toetoe*) grows everywhere in Aotearoa, but is mostly seen in groups near the sea coast or edges of wetlands. Kawhia.Māori.nz (2009), describes toetoe as being "the largest and most beautiful of the native grasses". For example it has "tall, white feathery plumes on straight stiff brown stems and stand four feet or more above its reed-like leaves which bloom in spring and early summer" (Kawhia.Māori.nz, 2009).

Toetoe is restricted to growing in wetlands and were utilised in many ways like the tī kōuka. Traditionally, stems of the toetoe were utilized to line inner walls, roofs and other partitions of houses and building (Scheele & Sweetapple, 2010b, Kawhia.Māori.NZ, 2009). Toetoe was

cleverly used in other ways as described by Scheele & Sweetapple (2010b), "The hollow culms were also fashioned into shafts for hunting arrows, spears, pipes and frames for kites", also "leaves were used for weaving mats and baskets, after first removing the sharp leaf margins".

### Wetlands - Intrinsic Value to Māori

Historically, the relationship between Māori and culturally important resources was an intrinsic part of life in Aotearoa. Māori were dependent on an intimate understanding of the physical environment, and a detailed knowledge of the land, the sea, plants, and fish. Such knowledge was entwined with spiritual and cultural beliefs and were passed via practice and traditional stories from generation to generation.



*Oreiwhata Urupā, Pukehina.*

*Image: Tracey Takuira, 2015.*

For generations, Māori have always maintained their strong cultural and historic links with wetlands and inland waterways, including lakes, rivers, streams and springs (Selby, Moore, & Mulholland, 2010). These taonga are spiritually significant and closely linked to the identities of tāngata whenua. Māori depended upon wetland areas, and were very protective over their natural resources for survival.

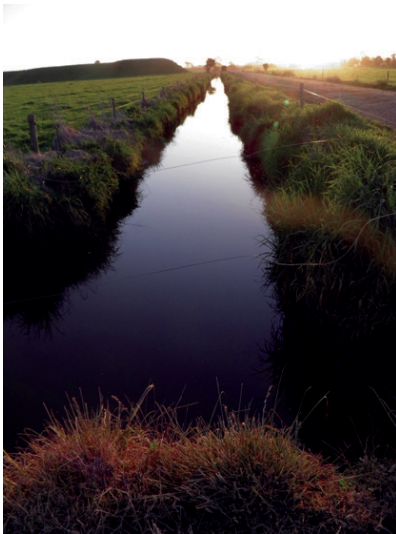
Wetlands provided Māori with important resources for rongoā (medicines), dyes used for seasoning timber and restoring precious artefacts, as well as building and hunting and fishing materials (Waikato Regional Council, 2013). It was their Mahinga kai basket, and kai such as tuna, inanga (whitebait), mullet, flounder were abundant as well plants harvested for kai, rōngoa and raranga, such as harakeke, raupō and tī kōuka were essential fibres to building and for hunting materials (Firth, 1929).

For Māori the waterways were regarded as an important means of travel and many whānau, hapū and iwi placed their homes nearby (Firth, 1929; Stafford, 1986).

Māori developed a set of practical rules to protect the natural habitat, allowing regeneration.

Māori fishing operations were very well organised with different tribes having their own fishing areas. Fishing was often a community activity involving everything from observing the movement of schools of fish and making hooks, line and sinkers to catch fish (Firth, 1929). Consequently Māori knew a great deal about the life cycles of different fish (Ministry of Fisheries, 2014), and more importantly continual practices of harvesting resources ensured whānau interaction and transmission of cultural practices between generations (Selby et al., 2010).

As generations have come and gone, over time there were a number of amendments made to the governing legislation from 1860's to the 1900's, that did not benefit Māori (Hitchcock, 2008). As explained by Stephenson (2001) legislative and administrative polices were designed to further the interest of settlers, with little concern of the impacts upon Māori.



*Waterway leading to main drain, Pukehina.*

*Image: Tracey Takuira, 2014.*

Resource Management Act s6(a), (2), The Land Act 1895 stated; Roding, drainage and farm development favoured European settlers without considering the impacts of encroaching upon Māori reserves of food sources or destruction of fishing grounds, such as eel weirs that have been used for generations.

The ecological, social and economic impacts of the past two centuries has dramatically changed the relationship between Māori society and important resources including the taonga species like kuta and pīngao (Stephenson, 2001).

Noticeably, since early European settlement, activities associated with economic development of Māori land into productive viable farmland, are removing large areas of natural wetlands (Waikato Regional Council, 2013). As a result "swamp drainage for settlement and agricultural activities, and the introduction of new and sometimes invasive species" according to Selby (et al., 2010, p. 202), "significantly altered indigenous wetland ecology".

Wetlands act as the natural boundary between land and water, and no two wetlands are exactly alike as they can vary widely because of regional and local differences (Johnson & Gerbeaux, 2004). Such as soil types, topography, climate, hydrology, vegetation, human disturbance, and may change over time as environmental conditions alter (Bay of Plenty Regional Council, 2015). According to the Department of Conservation (2013), "Wetlands are not wastelands, they help remove excess nutrients which come from human activities and turn them into food for plants, animals and humans.

Regarding wetlands, Hunt (2007, p. 19) stated, "It is estimated that wetlands (including lakes and rivers) currently occupy less than two percent of New Zealand's total land area, when once they constituted 20 percent. Looking at those figures another way, this means that 90 percent of the wetlands that were here on the day that Cook and Banks sailed by are now gone". Today, "the transformation of the wetland ecosystem as a consequence of drainage and conversion, is a

narrative loss and disconnection that has contributed to the fragmentation and modification of Māori communities" (Selby et al., 2010).

Māori view themselves as holding a special relationship to Papa-tū-ā-nuku and her resources (Marsden 1992). Māori saw themselves as tiaki (preserver, protector), who nurtured and cared for the land, which was gifted from Io Matua and was to be preserved and nurtured, for future generations" (Miller, 2011, p. 147). As Māori and tiaki, to preserve and protect was practiced with the knowledge that Papa-tū-ā-nuku is a living organism with her own biological systems and functions, which provides a network of support systems for all her children that live and function within her (Marsden, 1992), for example, "The streams of water are her arteries, bringing life giving waters for her to imbibe and share with her offspring", in the same way the streams act as alimentary canals and help in the disposal of waste (Marsden, 1992).

Tiaki means to guard, but it has other closely related meaning depending on the context, for example tiaki can also mean to keep, preserve, conserve, foster, shelter and keep watch over. Adding the prefix kai with a verb tiaki implies action, thus a kaitiaki becomes a guardian, keeper, preserver, conserver, foster-parent, and protector. By joining the suffix tanga to the noun kaitiaki, kaitiakitanga means guardianship, preservation, conservation, fostering, protecting, and sheltering (Marsden, 1992, p. 15).

Within the Resource Management Act 1991 kaitiakitanga is defined as the exercise of guardianship by the tāngata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources; and includes the ethic of stewardship (Marsden (1992). However, Marsden (1992) explains that "This term stewardship is not an appropriate definition of kaitiakitanga, as the original English meaning of stewardship, is to guard someone else's property, having overtones of a master-servant relationship". The traditional role of guardianship is based on respect and reciprocity, enforced by divine retribution or confiscation of resources.

According to Barlow (1991), kaitiakitanga is the act of guardianship as an inherent responsibility through whakapapa. Key concepts within kaitiakitanga include whakapapa (lineage), rangātiratanga (authority), mana (prestige), mauri (spiritual life-principle), tapu (sacredness, set apart), rāhui (prohibition or conservation), manaaki (hospitality) and tikanga (obligations and customs) (Kāwharu, 2000). Kaitiaki according to Barlow (1991), "kaitiaki are the messengers and means of communication between the spirit realm and the human world".

In an inter-cultural context, Kāwharu (2000, p. 353) states, "Today, kaitiakitanga is a tool used by Māori, to promote their unique status as tangata whenua, while also affirming certain rights guaranteed in Article Two of the Treaty". For example, "Kaitiakitanga is one of the most potent political tools used by Māori to promote unique rights, for contributing toward a wide range of resource management initiatives" (Kāwharu, 2000, p. 354).

Further to this "Kaitiakitanga should be defined not only as guardianship, but also as a resource management tool for example, it embraces social and environmental dimensions whereby human, material and non-material elements are all to be kept in balance" (Kāwharu, 2000).

At present, iwi/hapū involvement as kaitiaki for the natural taonga in their area, are highly dependent upon the Resource Management Act 1991 (Parliamentary Commissioner for the Environment, 1998). In improving outcomes for Māori, there should be an attempt to identify a reasonable balance between the social relationships, and values attached to the land and the goals of economic development (Sharp, 2013).



## Methodology Overview

The research framework was based on kaupapa Māori theory. Kaupapa Māori theory, challenges dominant Pākehā notions of theory, and provides counter-hegemonic practice and understandings (Smith 1997). It is a theoretical framework that challenges the oppressive social order within which Māori are located and does so from a distinctive Māori cultural base.

The knowledge base that informs kaupapa Māori theory is based upon and informed by mātauranga Māori (Pihama, 2010). Kaupapa Māori knowledge is distinctive to Māori society, and is a body of knowledge accumulated by the experiences through history of the Māori people (Nepe, 1991). Therefore, the purpose of the research is looking at our waterways and wetlands, flora and fauna and their value through a weaver's lens thereby placing the researcher at the centre of this investigation

## Methods

Interviewing is a central activity to qualitative research, which nine participants were selected, who were already known to the researcher, were interviewed between February and August 2015. The interviews were conducted *kanohi ki te kanohi* (face to face), and the times and location of interviews were always chosen by the interviewee to allow for comfort and ease, which took approximately 60 minutes. An information pack including consent form, a list of interview questions was given out before the interview was conducted which were audio taped and transcribed with transcripts returned to the participants to check for accuracy. A summary of the findings was given back to the participant.

Data collecting using documents from the Māori land court files. These are a ready-made source of data easily accessible. Field study applying digital photography as a research method is very useful in visual recording. Pūrākau and arts-practice based research were also methods employed as they reflected the inherent way of seeing and doing things Māori through waiata, whakataukī, whaikōrero and visual art forms of tukutuku panels and whāriki.

## Background of Study

The research is situated at Pukehina which runs adjacent to the coastline in the Bay of Plenty, New Zealand. The entire land area is steeped in history as Stafford (1986) describes four Pā sites located on the whenua; Poutuia, Pukehina, Ōreiwhata and Waeheke. These pā and all this country formerly belonged to the Waitaha-tūrauta tribe, the clans that Maruahaira found here on his arrival are believed to be some of the original people of the country, they are said to be of "Te Whānau ā-Toi" (The family of Toi) or his descendants: 1) Te Rarauhe -tūrukiruki, 2) Te Rarauhi-maimai, 3) Te Tūruru-mauku, 4) Te Raupō-ngāohoehe, 5) Te Tawa-rāraki, 6) Te Kōtore-ō-hua.

Koro Rimini (1893) writes "Maruahaira killed all these people in the days of old, hence this country passed to him. At the death of Maruahaira, his offspring Maraika grew up and remained continuously on the land. On the death of Maraika, his offspring Kaiākau grew up and lived constantly on the land, and so it continued during each generation after Maruahaira down to the generation of Te Rangituakoha and his brothers, that is down to the time of English law.

If we allow 20 years to a generation, and suppose that Maraika must have been at least 20 years old at the time of the fall of Pukehina, we shall find that this event occurred about the year 1690. When Te Rangituakoha and his brothers died, his son Mita Te Rangituakoha (Mita Tahoka) and his cousin Timi Wāta Rimini grew up and dwelt continuously on the land". Now from Maruahaira down to the time of Mita Tahoka and Timi Wāta there are ten generations.

## Research purpose

In recognition of the traditional practices and whakapapa of Pukehina whānau, whakapapa and whenua, this research aimed to identify, evaluate, and document kaitiakitanga of whenua and its natural resources of flora and fauna and Mahinga kai sites for the benefit of future generations.

Key inquiry areas:

1. Investigate practices of kaitiakitanga towards our cultural resources and wāhi tapu sites at Pukehina.
2. Study the revitalization, nurturing and sustainability of wetlands and waterways at Pukehina.
3. Evaluate the effectiveness of our Māori land use, for the benefit to whānau, hapū, iwi, tāngata whenua katoa.
4. Utilize customary resources such as pīngao and harakeke in a display of art works to share and highlight their important qualities as taonga tuku iho.

## Findings

The interviews conducted provided information that will be shared in the participants own words around taonga tuku iho, such as Ruahine, Waiheke lagoon, Te Ūnahi, farming and whenua. Waiata, whaikōrero around whakapapa, whānau and whenua provides a wealth of information to learn about how Māori view and experience the world, how they think, act, and feel.

### *Ruahine*

Ruahine is considered our tapu (sacred) mussel rock given to us and looked after by several tiaki. There are restrictions of who can go onto Ruahine to harvest, and if you are not meant to be there the tiaki will let you know.

*"It has three kaitiaki yet four come and the first of the warnings is the ripple of the water, the roughness of the sea. Don't listen to that then you got the shark, don't listen to that, then you got the manta ray, not the stingray, the manta ray. The manta ray is well known in measurement and covers over the six-metre-wide rock, the manta ray covers that, that's when you don't come back".* Uncle Patihana

### *Te Waipuna*

On each of the farms of Pātara, Hoani, and Parekitaurangi there are many fresh water streams as well as springs. Koro Harry, a diviner of water confirms this and states, *"There's water over the whole place here, over the whole lot, water everywhere, and its fresh water too. It's running out to sea there eh".*

In regards of sustaining these many puna Uncle Patihana had this to say, *"Today because they're putting diggers in there, they're actually cutting the water supply. How do they do that? Well when a flow is happening, and you dig into it, that water's not going to carry on, it's going to go another way or it's going to filter out and go find another trail underground. So that's the sad part about our puna starting to dry up, they are also getting affected by the advancing technology, rather than preserving the land".*

Today Te Waipuna still makes it way out to the sea despite having suffered a huge landslide during a storm. Other springs are still bubbling out freely on each block of land today. Having such significant sites that still supply us with fresh clean water needs to be nurtured and sustained for the benefit of our future generations to come taonga tuku iho.



### *Waiheke Wetland Lagoon*

Before the whenua was drained, the flow of the water went back towards Waiheke and out to the ocean that way. Koro Harry relates, *"Most of water came off the hills, those MacDougall hills, the water came from there mostly and it stayed there below your place aye that's what they call Waiheke. There was a lake there, it was wet all the time because it couldn't get out, all the water supposed to go out to the sea on your side"*.

Today, the whenua has been drained of its excess water that once upon a time use to exit below Waiheke pā. Uncle Tāne and Auntie Paea remember having to go and unblock the lagoon below Waeheke, especially after a heavy rain the whenua would become even more water logged, and so it was the boys who had to go out to Waeheke and dig an outlet for the water to escape to the ocean. *"We used to love it when it thinged up. Every time there was a storm, we got to go and dig this place out. O the digging of it, mind you it was fun too, once the water starts running, it opens itself out aye, sit down right in the middle like a slide into the breakers and back up again, run and jump in the next middle of the opening, because it gets stronger and stronger as it gets deeper. O yes we loved that"*.

### *Te Ūnahi*

Te Ūnahi is another pā site existing on the whenua, this pa was where Takuira and Parekitaurangi had their home. When the whare was dismantled the maihi and amo were buried just below in the swamp. This site was later confirmed by being included and marked as one of being a significant site in history of Ngāti Whakahemo.



*Te Ūnahi pā, Pukehina. Image: Tracey Takuira, 2015.*

### Farming

Interviewing helped to gauge whānau's perspective on farming and particularly farming Pukehina block. From 1961 for 21 years, Koro Harry had the lease for all three blocks, Pātara, Hoani and Parekitaurangi. Today, Pātara's and Parekitaurangi's land blocks are both being leased by a nearby farmer Watts Holdings Ltd, while Hoani's block is being leased by another nearby farmer neighbour, Jeff and Lynette Taft. The nature of leases today generally speaking, are shorter periods than previous times, and are mostly with a right of renewal.

Concerning the view of kaitiakitanga, looking after the environment and enhancing it, for the next generations was a theme that emerged from all three farmers. Jeff and Lynette both agree, "We're in a time now where everyone is more aware of it aye, like the waterways keeping them clean and Fonterra had a program that's finished now. All dairy farmers supplying milk to Fonterra must have their waterways fenced otherwise they can refuse to take your milk if you haven't done so. Fonterra want to be seen to be environmentally friendly, because they are trying to sell all our product overseas and the markets over there are getting particular about how your producing your product so I think everybody, each generation is getting more and more aware".

There were strong messages received about the future of our whenua in terms of retention and utilization going forward. Today, as kaitiaki and Māori land owners, we must ensure the land is developed so that it can provide sustenance, while at the same time ensuring the land stays in Māori hands and can be passed on to future generations.

## Whenua

Concerning the lay of the land of Pukehina Land Block around the 1940's to 1960's, the whenua was wetlands and Pukehina beach road did not exist. The road for all three whānau was through Parekitaurangi and Takuira Pukehina M1B4 and out through another farm owned then by the Winter's family. *That was the road for the whole block, the whole three, there was no way down this way, nothing no road down, they all had to go out your way, see this only came later.*

## Conclusion

The ancestral landscape is constantly changing, and the diversity in land use and ecological change, reflects the evolving community values and needs (Selby et al., 2010, p. 215). An emphasis on sustainability and ecosystem restoration is a new strategy for re-establishing connections with natural resources and for consolidation of existing knowledge as well as development of new knowledge. Therefore restoring the mauri of compromised wetlands and ecosystems is important to enhancing whānau, hapū and iwi social, spiritual cultural and economic well-being (Stephenson, 2001).

Throughout this research an illustrious whakapapa was shared, that traces back to Te Arawa, Mātaatua, and Takitimu waka as far as Hawaiki (Stafford, 1986). The korero shared orally by whānau, was likened to weaving a whāriki, so many strands of whenua lovingly woven together in a papa. As each papa grows the hono or hiki that joins and holds each papa together, and when the article is finished it gives much prestige to the completed house, this study.

As kaitiaki living on the whenua, we must ensure the land is developed so that it can provide sustenance, while at the same time ensuring the land stays in Māori hands and can be passed on to future generations (Hitchcock, 2008).



*Poutuia pā, Pukehina. Image: Tracey Takuira, 2015.*

"*Taonga tuku iho; nā ngā tūpuna,*

A cultural heritage, from our ancestors"

(Puketapu-Hetet, 1999).

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## GLOSSARY

Amo	Bargeboard support
Aotearoa	New Zealand
Hapū	Subtribe
Hiki	To lift and move
Hono	To join
Inanga	Whitebait
Iwi	Tribe
Kai	Food
Kaitiaki	Guardian
Kaitiakitanga	Active guardianship
Kanohi ki te kanohi	Face to face
Karakia	Prayer
Kaupapa	Purpose
Kaupapa Māori	Research approach
Kawa	Protocols
Korari	Flower stalk
Koro	Elderly man
Kotahitanga	Working or coming together
Kuku	Mussel shell
Kūtai	Green-lipped mussel
Mahinga kai	Food-gathering places where food is traditionally gathered
Maihi	Barge boards from house often adorned with carvings
Manaaki	Hospitality
Mana	Prestige, authority, control, power, influence, status
Manu aute	Kites
Māori	The indigenous people of Aotearoa
Matariki	Indigenous New Year
Mātauranga Māori	Traditional knowledge
Mauri	Spiritual life principle
Mokopuna	Grandchildren
Muku	Prepared flax fibre
Ngā	The (plural)
Pā	Fortified village
Pākehā	English, European
Papatūānuku	Mother Earth
Pūrākau	Stories



TE RANGAHAU TAIAO KI AWANUIĀRANGI

Rangatiratanga	Sovereignty, right to exercise authority
Raranga	Weaving
Rongoa	Remedies/medicines
Taiaha	Weapon
Take	Hard base of a flax leaf
Tamariki	Children
Tāne Māhuta	God of the forest
Tangaroa	God of the Ocean
Tangata whenua	People of the land, local people
Tāonga	Treasure
Tāonga tuku iho	Treasures handed down
Te Taiao	The environment
Tikanga	Correct procedure, custom
Toi	Art
Tuna	Eel
Tūpuna	Ancestor
Wāhi tapu	Sacred place
Wai	Water
Waka	Canoe
Whakapapa	Lineage, genealogy
Whānau	Family
Whare wānanga	Learning house
Whāriki	Floor covering/mat
Whenua	Land



*Te Rangahau Taiao  
ki Awanuiārangi*

CHAPTER SEVEN:

**THE MARAE IS A FOUNDATION FOR KAITIAKITANGA.**

*Babbington, R. (2014)*



Ko Mangatū te awa  
Ko Mangatū te marae  
Ko Horouta te waka  
Ko Ngāriki Kaipūtahi te iwi  
Ko **RENE BABBINGTON** ahau

**The Marae is a Foundation for Kaitiakitanga**

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## Abstract

Defining kaitiakitanga is intricate and may mean different things to different hapū and iwi. Kaumātua play a critical role in delivering whare Mātauranga, the repositories of knowledge to whānau, hapū and iwi. Understanding how our tīpuna lived, the ahi kā and kaitiaki roles and responsibilities they had, and how it was passed onto each generation to ensure the survival of the marae is critical. Through the life history of the Mangatū marae moments of kaitiakitanga are made visible and these moments in time consolidate the extreme importance and role of marae in sustaining our communities. This chapter explores how the kaitiakitanga of our tīpuna is being transmitted down through the generations, to enable a strong base for future generations to stand and stand strong. It also questions how we think about and apply the concept of kaitiakitanga practices on the marae today, and confirms the marae as a foundation for kaitiakitanga.

## Mangatū Marae

The body of the building is not simply a metaphor for the life and continuity of the whānau; it is the body of an ancestor. The whānau inhabit the body of the ancestor, and in this sense the building lives. The head is at the top of the meeting house, above the entrance, this is called the kōruru. The arms are the maihi and slopes down from the kōruru to form the roof.

The tāhuhu is the long beam running from the front to the back along the backbone Ranginui-e-tū-iho-nei of the roof. The rafters, the heke, are the ribs of the building. The walls of the building are pakiwaitara they are the pūrākau, myths, interviews, references and stories of Mangatū held within

There are three entrances onto the marae. There is the back entrance; for the ringawera and supplies. There is the side entrance which is known as the Pākehā gateway and the third entrance is through the waharoa known as Matua Kore, where the ritual of encounter is performed.

There are a number of wāhi taonga on the marae; a kōhatu Huunia Huunia was gifted to Hone Ahuroa II, in 1918 by Tūhoe, a kōhatu Ngoi Pēwhairangi was gifted to the marae in 1991 by Te Ataarangi and a kōhatu Tūmatauenga was gifted to the marae in 2008 by the Lloyd whānau. A wānanga was held to weave three whāriki for the marae. There are wāhi taonga hanging in the wharenuī and the smaller wāhi taonga gifted to the marae are being looked after by whānau, because there is nowhere to ensure their safety at the marae. Included in the marae complex is wāhi tapu, which provides the spiritual and cultural base for Māori. Mangatū have three urupā. There is Te Onehou; it is alongside the Mangatū River; the urupā has been flooded numerous times and is no longer used. Te Parapara is the top knob on the hill which overlooks Pākōwhai Native Reserve and the current urupā is called Tapuae o Te Rangī. When one enters the urupā, one is walking into a 'place' and 'space' of intrinsic 'tapu' and 'timeless rituals'.

Tapu and mana are fundamental Māori concepts that must be understood to truly grasp the significance of marae and how it might inform a model for and/or of kaitiakitanga. Pā Henare Tate (2010) asserted a triple-prong perspective of tapu encapsulated within the concepts of "te tapu ī" and "te tapu ō". Firstly, "te tapu ō" pre-supposes that there are issues of access that restrict and control right of entry between realities; atua, tāngata and whenua. Underpinning the concept of "te tapu ī" lies an understanding of the tapu "being-in-itself" (p.42) or that each reality has within itself intrinsic tapu value. A third aspect of tapu speaks to tapu as being-in-relationship with itself, as the primary being' and/or other beings or realities. In any event governed by the laws of tapu each reality intrinsically operates to acknowledge and respect "te tapu ī" and "te tapu ō" such that they "enhance, sustain, restore, and empower those in relationships" (p.42).



### What happens at Mangatū marae?

The place that tapu was encountered was at tangihanga where restrictions and controlled access associated with tapu governed everyday behaviour. At Mangatū the karanga goes out to whānau, it is then up to each whānau to make the call to their respective whānau. If the "deceased" lived at home, whānau go to the house, to awhi, manaaki and tautoko the bereaved whānau. The bereaved whānau are wahangū, which means within the metaphor of the rhythmic vibration of creation, they take up the vibration of silence, te orongu. Te orongi (Tamanui 2012) and the vibration of life are sustained by the extended whānau, hapū and the work of life is sustained by the whānau. The marae practices the tikanga of kirimate, this means; when the deceased is related to people who normally take roles in the front, calling and speaking and in the back, ringawera or hangī maker, it is expected others of the other whānau will do these tasks for them. This favour is repaid by the grieving whānau at future tangihanga. Dickson (2011) states the role of the kirimate is to concentrate on mourning for the deceased. Ordinarily, therefore a spokesperson is nominated, to work directly with ahi kā, who are those whānau attached to the marae "who keep the home fires burning", so there is a seamless support, to enable the grieving process to occur. If whānau are not familiar with the process of using the koha for tangihanga, ahi kā will support whānau to ensure the tikanga is carried to uphold the mana of the marae, by looking after their manuhiri.

Ahi kā is the 'first response' people for anything happening at the marae. They would go about preparing the marae. Those in the 'back' prepare the food, this entails organising the meat and other contributed produce that will support the stores. Those that work in the wharenuī to receive the whānau and those delegated to the task of the ablution area, grounds and the gravediggers are part of the back and will only work those specifically designated areas. Their work spaces are set apart. Unless there is a shortage of helpers, workers in one area will not cross to work in the other and should the need arise they must obey the strict rules of not just hygiene standards but the controlled rules associated with crossing boundaries, such as the washing of hands and/or the sprinkle of water over their heads when leaving the wharenuī, there was also the prohibition of food in the wharenuī. Whakanoa means to be free from tapu (Keane 2013).

The women assigned to the wharenuī make the beds and set up the moenga tūpāpaku. Tipuna are represented in the wharenuī by photographs hanging on the walls. These portraits constitute the representation of the most recent descendants. During the tangihanga photographs of the deceased are placed at the end and around the coffin, along with those of male and female ancestors as well as of other close relatives and friends who have died. In the past, Salmond (1975 p.41) reports, photographs were put in order by the kaumātua of the marae, who arranged them according to family affiliations.

Those assigned to the work in the 'front' include Hāhi ministers, kaumātua, kaikaranga, kaiwaiata and the kaikōrero. Kuia also play an important part in the 'front', with divisions of labour assigned for sitting on the verandah, to the right and those on the left, who will care for the tūpāpaku and the kirimate and in addition who will relieve the kirimate during times of eating, washing and resting. Meal times are the exception of crossing boundaries where those in the 'back' have the opportunity to sit with the tūpāpaku and at the same time there is a double function that creates an opportunity for the kuia and kirimate to rest.

The kaumātua on the pae, play an important part in the 'front', one such role is raising the flag. The first time the flag is raised it is raised to the top of the flag mast, when the tūpāpaku arrives and is taken onto the marae, it is then lowered to half-mast (Personal communication, Smith Nov 20, 2013). It indicates to people going past, there is a tangihanga.

Through the karanga the tūpāpaku is welcomed onto the marae with the kirimate and the manuhiri, whānau openly weep and comfort each other. Karanga is the spiritual rope that binds the whole process together. Kuia on the verandah wail uncontrollably. These kuia have been exposed to this way of expressing their feelings and they lead the wailing as manuhiri come onto the marae. The karanga interweaves the dead spirits of our ancestors together, offering them a spiritual link to Hawaiki, she beckons the carriers of the tūpāpaku and the kirimate to move slowly to the wharenuī, the tūpāpaku is laid on the veranda next to the whānau who are waiting. The tūpāpaku lies in state, in an open coffin and is never left alone. Food or drink is prohibited around the tūpāpaku and the kirimate is not to be bothered with the organising of the kai and the tūpoupou is forbidden to leave her place to go to the kitchen to cook.

The manuhiri move slowly and stop at the puku of the marae ātea and with the tāngata whenua bow their head in remembrance. After a few minutes, a gesture from the kaikaranga will let the manuhiri know "kua ea" and invite them to sit, the manuhiri slowly move back to the manuhiri pae to establish the tapu of the realities, once there they sit and wait; their speakers position themselves in the front row seat. Tāngata whenua wait until manuhiri are seated, then they sit.

The order of whaikōrero and mihi is determined by the kawa of the marae and supported by atua and tūpuna. At Mangatū the kawa of the whaikōrero is "pāeke", tāngata whenua speak first, whaikōrero is undertaken by an orator who is well versed in tribal whakapapa and the spiritual, political, social and economic realities of the iwi takes place from the pae tapu followed by manuhiri, until the final speaker. After each whaikōrero an appropriate waiata is sung by the kaiwaiata. After the last tāngata whenua kaikōrero has spoken he will then pass the rākau to the manuhiri. They follow the same process and at the conclusion of the final whaikōrero and waiata the last orator moves across the marae ātea and places a koha on the ground by the tāngata whenua.

Koha are gifts to the hosts, often in kind, food or traditional items, but money is most commonly used today. The acceptance of the koha and closing speech by the final orator of the tāngata whenua picking up the koha ensures the mauri remains with the tāngata whenua.

The ritual of encounter ends with a hongī, the pressing together of noses and the sharing of breath. The origin of hongī lies with the Atua Tāne Mahuta, who breathed air into the soul principle of Hine-ahu-one the first human being, bringing her life. For the next two days, the marae will be committed to meeting the needs of the expected visiting mourners and the kirimate.

### A history of marae in Mangatū

The original whare was a small raupō house that was built about 1850 or even earlier, it was known as 'Omapere' and was situated alongside the Omapere Creek. During that era whānau lived at the whare and they also lived in kāuta beside the whare. They supported every kaupapa at the pā, by providing kai at regular events that occurred (Personal communication, Smith Nov 20, 2013). During this early period life was hard. The standard of living was barely adequate to support life (Melbourne 2011, p.168). Knowledge was not freely transferred to the younger generation, creating a sense of loss of identity which would simply compound with future generations.

### Te Ngāwari I - 1860's

This period marked the first phase of the Poverty Bay Māori Wars that began in 1865 at Waerenga-ā-Hika, the killing at Matawhero occurred in 1868 and in 1869 approximately 128 Tūranga

Māori were unlawfully executed at Ngātapa (Waitangi Tribunal, 2004). In 1869 Pera Te Uatuku, Te Hira, Rēwi Totitoti, Hōri Puru, Rūtene Ahuroa and Ruka Tahuateka, who were on the run with Te Kooti, returned to Mangatū and settled at Urukokomuka (Waitangi Tribunal, 2004).

The original Mangatu land consisted of 65,026 hectares and was partitioned into six blocks. The Māori Land Court claim for ownership began in 1881 when Wiremu Pere lodged a claim for the right of ownership in the names of the Wahia and Ngāriki hapū; the title determination of the Mangatū Block was unsafe (Waitangi Tribunal, 2004).

The impact of Pākehā and Māori land grabbers had taken its toll through greed and broken promises. The Māori land wars and land confiscation soon had Māori stripped of their mana, livelihood and control of their own destiny (Melbourne 2011, p.168).

The Ringatū faith was founded by Te Kooti Arikirangi Te Tūruki on Wharekauri, during his captivity there between 1866 and 1868. After Hōri Puru and others returned from Wharekauri, Mangatū became followers of the Ringatū faith.

For many years the owners of Mangatū lived on their papakāinga which consisted of five hundred acres. The settlement was known as the Mangatū Pā, whānau lived in kāuta which surrounded Te Ngāwari I.

### Te Ngāwari II - 1922

The 1920s - 1960s marked the rural-urban shift and the attempt to assimilate the Māori people (Ruwhiu, 2009). It was the time of the depression; casual work was hard to find and many Māori were unemployed. There were other issues such as healthcare and whānau size.

In 1922, a new wharenuī was built on the Pākōwhai Native Reserve, beside the Mangatū River, whenever the river flooded, it would leave behind sand and mud. Many whānau lived at the pā until they got their own papakāinga; some lived in kāuta around the pā. There were also whānau who lived in tin and corrugated iron homes not far from the pā. It was post war time of big whānau, the baby boom, and the average whānau was about fourteen children (Journal entry, Irwin Nov 14, 2012).

### Te Ngāwari III - 1950

Life at the pā was whānau gatherings, Māori Women's Welfare League activities and hui, karakia, tangihanga and whānau celebrations.

It was in this period that the project to build a wharekai and wharenuī for the Te Aitanga a Māhaki Iwi was made; it was instigated by Eddie Hooper, the secretary of the Mangatū Blocks Incorporation. Mangatū was nominated for a new building. Sir Apirana Ngata, the Māori renaissance leader of the early 1900s, promoted the building of modern type marae in support of his desire to have Māori revitalise their culture (Walker 2001). Ngata's work led to a great revival of interior decoration for Māori carving and revitalisation of tukutuku weaving, designs and features in whare whakairo, wharekai, and churches.

At this time, the whānau decided to move the pā to higher ground, 400 hundred meters behind the pā, still on the Pākōwhai Native Reserve. The building of the dining hall was started in 1952.

Hone Taiapa was the master carver. The carvings convey meanings of the past and compliment the patterns of the tukutuku weaving. Around the walls of the wharekai and on the stage, there portrays a combination of the carvings. Manaia and taniwha figures feature merged together.

The manaia can be seen blended into many Māori designs with subtle differences between tribes and is a holder of great spiritual energy and is a guardian against evil. The taniwha represent kaitiaki of the whānau and has been incorporated by the carvers to reflect belief in mythical beings (Journal Entry, Irwin Nov 14, 2012). A flag cenotaph was also instigated to honour the local soldiers. It was dedicated the same time as the opening and it was to commemorate Tūmatauenga in the first and second World Wars.

As the wharekai was being built in Mangatū, a wharenuī was being built at Takipū in Te Karaka. The Mangatū Blocks Incorporation called the two marae to a hui, to discuss and plan an opening for the two houses. This was to be a momentous occasion for Mangatū and Takipū. The opening of two houses was held on the 8th & 9th March 1958. It was a commemoration combined into one hui.

### Pā on the move - 1985

A concern for the pā and talk of moving it to higher ground was discussed. In April 1982, the flood situation was discussed yet again and a proposed site was inspected for the shift to Whatatutu, land was purchased from Middleton's and finalised on the 16th August 1984. The move was scheduled for the 15th January 1985 (Personal communication, Irwin Dec 8, 2013).

Te Ngāwari III was the first of the two buildings to leave the pā site, this momentous occasion was marked with karakia, prayer and song on the morning of the 15th January 1985. The move has meant the end of an era where memories will live in the minds of our kaumātua, kuia and whānau, but the closing of that era, brings with it the opening of a new and progressive era, where history will be carried into the future.

### From a Pā to a Marae

The transformation from a pā to a marae happened when the buildings left the Pākōwhai Native Reserve it was known as the Mangatū Pā; when the buildings were placed at 39 Te Whiwhi Street, it became known as the Mangatū Marae. The name change from the Mangatū pā to Mangatū marae eventuated when it was moved to its new location, perhaps because of the more modern terminology. Despite the transformation from the pā to marae, it continued to be the focal point for whānau.

### Kaitiakitanga - Mana Whenua, Mana Tūpuna, Mana Atua

Kaitiakitanga is mana whenua, mana tangata and mana atua. There are three ancient pathways to obtain mana. Mana atua refers to divine and ultimate authority and eternal life force 'being with mana and tapu' from the gods. Mana tūpuna pertains to the ancestral authority and includes tribal knowledge, sovereignty, traits, artefact, language and genealogy itself 'being with mana and tapu' passed on from our tūpuna. Mana whenua or land authority refers to mana obtained through tribally or individually lived experiences of, with, in and through the land or one might say 'being with mana and tapu' derived from our primordial first mothers (c.f. Marsden, 2003, cited in Tamanui, 2012).

### Mana Whenua

Perhaps the most conclusive assertion of rights to exercise kaitiakitanga was occupation. Mana whenua refers to the mana held by local people who have 'demonstrated authority' over land or territory in an area, authority which is derived through whakapapa links to that area (Tamanui

2012). Whenua retains our history, our whakapapa, 'he taonga tuku iho'. Whenua is also the placenta that provides nourishment. A return to one's marae is a return to the land, to one's roots in the soil. After the birth of a child, the pito and the whenua are buried in the ground or placed in a tree used for that purpose (Royal, 2012). The afterbirth ensures a strong link with one's own land. Papatūānuku the land is mother and the source of nourishment and shelter for the people (Royal, 2012). The land is our link to the generations of tūpuna who resided here in the past and indicates the growing development of the iwi. Whānau are the kaitiaki with responsibilities to past and future generations to ensure the marae continues to function as a communal home, you need people to occupy it, and it is mana tūpuna who defines people.

### Mana Tūpuna

Mana tūpuna helps us know who we are, from whom we descend and what our commitments are to those who come after us. This is achieved through the recital of whakapapa and tracing the descent from te kore, te pō, te ao mārama. Upholding this mana is about honouring the traditions and tikanga of those that came before. The challenge is to find ways of "applying intergenerational knowledge to contemporary contexts".

Traditionally, humans have a threefold mana. Firstly, there is the mana a person is born with through whakapapa. Secondly, there is the mana that people give; the mana we have for kaumātua, the respect for their mind and soul, their life experience and their wisdom.

Thirdly, there is mana for the marae; the manaakitanga on the marae is the expression of aroha, hospitality, generosity and mutual respect for manuhiri, because when they leave they will tell everyone about the great experience, how well they were looked after and how well they were fed, which builds the mana of the marae and the tāngata whenua. On the other hand, if the manuhiri were not looked after, they would be fast to tell everyone about it, hence weakening the mana of the marae. It is ahi kā who ensures the tikanga, kawa and the mana of the marae is kept intact. Ahi kā means to keep the home fires burning and refers to a person keeping their rights to a marae warm or active. The opposite is to allow those rights to go cold or become ahi mātao by not keeping regular contact with the marae and by not meeting one's obligations to it (Dickson, 2011).

Ahi kā and kaitiakitanga is closely entwined, it includes notions of wellbeing, leadership, power and management of marae and hapū, of local issues, cultural and environmental knowledge and practices required to take on the role. Ahi kā is grounded in local knowledge and are the 'first response' people for anything happening at the marae. They keep alive the local growing up and childhood stories of the area; work on the marae; provide manaakitanga to manuhiri, pass on their intimate knowledge of the special places; get involved with local council issues; are protectors of the environment, the list is extensive. Upholding the functions of the marae is a major and ongoing part of ahi kā work. Being the holders of local knowledge of everything from whakapapa to environmental issues makes them key resource people at whānau, hapū and iwi levels. This broad scope of work often results in heavy workloads for a few home people.

Ahi kā is also seen as a model of leadership and a way of doing things. The leadership role is particularly evident when the haukainga have to go to work and are not able to help. It has a huge impact on kaitiakitanga and ahi kā, not having enough people to help. The leadership role of whānau, hapū and iwi is in sustaining the intergenerational succession on the marae. Historical and inter-generational responsibilities are that of the kaumātua. Kaumātua and rangatira are the principal kaitiaki of whānau, hapū and iwi, they govern tikanga and kawa on the marae and it is through kaumātua and kuia whakapapa is known.

## Mana Atua

Kaitiakitanga was a right delegated by the atua, but these rights had to be asserted. Principally this was done through occupation, hosting guests, naming features, marae, taonga, burial grounds (Kāwharu 1977). All Māori belong to a marae and can trace their whakapapa to that marae. They have the right to stand and speak and the obligation to look after and maintain the marae to uphold its mana. By linking to their respective kaitiaki a connection that crosses space and time is formed between atua Māori, tīpuna Māori and the environment.

## Aims of the Research

The research explored if the kaitiakitanga of our tīpuna is being transmitted down through the generations and to also enable a strong base for future generations to stand and stand strong. How we think about and apply the concept of kaitiakitanga practices on the marae today, will confirm the marae is a foundation for kaitiakitanga.

Three key objectives were developed:

1. To identify the traditional and contemporary roles and responsibilities of kaitiaki and kaitiakitanga on the marae.
2. To consider how te ao Māori knowledge on and around the marae has been transmitted down through the generations.
3. To determine how te ao Māori knowledge can contribute to the future aspirations of whanau, hapū, iwi and marae.

The research and researcher is located within a kaupapa Māori research paradigm. Smyth & Holian's (1999) view of insider research suggests that the "researcher who researches their own organisation can offer a unique perspective because of their knowledge of the culture, history and actors involved". The researcher's rapport with whānau is reinforced through the Māori cultural concept of Whakawhanaungatanga (Bishop & Glynn 1999a). The concept whānau indicates a much deeper, more intimate relationship than the more formal construct of researcher/researched.

In this case, the researcher shares a whānau link and a tribal connection; and is connected and committed to the research process itself. Kaupapa Māori research carries cultural expectations, which are expressed through tikanga Māori. Kaupapa Māori theory is the positioning of a Māori view as normal. Being connected to one's whakapapa, to one's whānau, hapū, and iwi provides Māori with an identity that revolved around the past, the present and the future (Roberts, Norman, Minhinnick, Wihongi, & Kirkwood, 1995).

## Research design

Whānau were approached and asked if they would like to be part of the research project. Consent was gained by all interviewees and a consent form was signed by each participant, however, participants were told of their rights and obligations to withdraw from the programme at any time. A mix of whānau whānui was selected and their ages ranged from 80 to 10 years old. Kaumātua, kuia, pakeke, rangatahi and tamariki were the makeup of the participants who are descendants of Te Aitanga ā-Māhaki and Ngāriki Kaipūtahi. A hui with a focus group was held and they became participants. The individual interviews were between 30 and 120 minutes. The interviews were recorded and transcribed, and the transcriptions returned to the interviewees for checking.



## Findings and Results

The kaupapa of the marae is whānaungatanga, manaakitanga, kaitiakitanga, mana tūpuna, whakapapa and te reo Māori. The lived realities of these values were discussed with whānau. Transitional periods throughout history demonstrate the changes that occurred and how it affected Māori (Durie, 2006). It started with the Māori land wars and the confiscation of Māori land then there was the wrongful imprisonment on Wharekauri Island, the meeting of Te Kooti and how the Ringatū Faith movement was introduced into the community. The great depression placed pressure on those who were part of the urban drift and the Second World War forced some whānau to move to the city in search of employment.

The ripple effect of the marae movement was evident with each period; whānau faced an immense range of concerns; the naming of the whare, moving the pā and the transformation from pā to a marae, the kaumātua, ahi kā and leadership status, the kaitiakitanga practices and the transmission of te ao Māori to future generations. To ensure the continuity of culture, naming places after ancestors and important events were another practical way of asserting kaitiakitanga rights.

In traditional times, the marae was the place where initial teaching and socialisation of things Māori took place. Whānau was based on kinship ties, common ancestors and an environment where responsibilities and obligations were maintained (Moeke-Pickering, 1996, p.2). Whānau who can no longer relate to their traditional roots feel alienated from the marae environment and have never gone back there. There are whānau who find the marae is a model for contemporary reality and feel it is the final refuge of Māori culture.

*Objective 1: Identify the traditional and contemporary roles and responsibilities of kaitiaki and kaitiakitanga*

A background study of tangihanga highlighted the traditional and contemporary roles and responsibilities of kaitiaki and kaitiakitanga. It has shown that tangihanga is regulated by its own tikanga and kawa; especially tapu and noa. The following subthemes highlight how whānau was affected by kaitiakitanga practices and policies.

### Ancestry

Traditionally, such knowledge is passed from generation to generation, with Māori relying on the recital of whakapapa by the appropriate tribal member, rather than on written documents. When whānau was asked if they knew the history of the pā/marae, one whānau linked his knowledge to; *Knowing how the wharenui got its name, the opening of the new pā site, the Mangatū River constantly flooding, then the pā moving to the top and the dynamics of the marae.*

One whānau thought information was not given freely. *What did kaumātua and tūpuna do at the marae. Did he know that? Was he aware of how they were and what they did at the pā, heoi ano he doesn't know everything they did? This is his reality of that history.*

Three whānau linked their sense of belonging to their ancestry. *They have their house but Mangatū marae is their home, where they belong, their connection to their ancestors. It is where they grew up, physically and spiritually, no one can take away their sense of belonging*

Another whānau wanted to know about the marae, *there isn't anything written about the marae, about the history, she thought it was good to be part of the interview and to have written information for future generation.*

### Childhood

Childhood featured greatly in response to one whānau who states; *Mangatū was one of his special places as a child, however two whānau had very little to do with Mangatū in their childhood.* Various gatherings at the marae were another feature and as such helping out was a requirement, the marae is a place where even as a child, they knew where they fitted in, one whānau commented: *“As a child the marae was a part of who he was. A place to meet whānau and a place he identified with history and whakapapa. At the marae, there was always a place for him, no matter what.*

For many whānau Mangatū marae was of the essence for more than just childhood memories, especially when whānau passed away. While childhood itself is not an event, the process of growing up and specific childhood memories were reflected on by five whānau. They *remember how Mangatū looked years ago, where they used to play, growing up, their nannies tangi, playing touch.*

Whānau were consistent in their expectation that Mangatū marae would be there for them and their children to use, a place they can take their kids to and be comfortable, whether they were raised there or not. One whānau said: *Her hope is that her children and her mokopuna will have the relationship to the past that she has always had, she'd like to move back to Mangatū at some stage for her tamariki to be able to grow up in her rohe to learn the marae tikanga and kawa.*

### Whakapapa

For most whānau Mangatū was a place to catch up with relations and visit those who lived in the surrounding area, as a marae it draws whānau back because of all the people who live there. It is through relationships that a connection with the marae and the land becomes significantly important. As one whānau stated; *the connection is vital to what makes a hapū and what keeps whānau together. The marae is alive because of the people who continue to look after it and the people who keep going back to it.*

Another whānau said, *you can't separate the people from the place. Like whakapapa you say who you are, what your links are, then you say where you're from, that reflects exactly which part of the whānau you are from, especially now when we are living all over the place and different whānau have settled elsewhere.*

### Tūrangawaewae

Using concepts such as tūrangawaewae as a place of belonging, whānau described how they positioned themselves in this world, how they are linked to the past and the future, and to other people and to Mangatū in all, creating a sense of belonging. Some whānau had little or nothing to do with Mangatū marae while they were growing up but felt connected to the marae because it was a special place to people who were important in their lives

Mangatū marae is where they grew up. Losing whānau has given them a connection to Mangatū marae, their tangi was held there, important people like them add to the value they place on the marae.

Eight whānau members used the terms 'tūrangawaewae', 'sense of belonging' and 'home' to describe what Mangatū meant to them, for example, 'their health and well-being, their home, their belonging'. In mentioning 'tūrangawaewae' whānau also tried to explain what this concept meant to them. It is home; it is a foothold of belonging. It's not just part of the history, but the history of the whole whānau and it is the whakapapa for the next generation.

*Objective 2: Consider how te ao Māori knowledge on and around the marae has been transmitted down through the generations.*

Whānau responses to various questions about their understanding of te ao Māori demonstrated what and how knowledge was being transmitted to the next generations. Knowledge stayed with one generation and over a period of years when it was the right time it was passed on to the next generation. Te ao Māori is whānau and whānau includes whānau, hapū and iwi, it is the extended whānau and more.

#### **Kaitiakitanga**

The word kaitiakitanga is a recent development, although the underlying principles have been practiced for hundreds of years. Whānau spoke of their progressive roles at Mangatū marae as they grew older and the expectation for certain whānau to take on tasks.

*As a child what he remembered of the place is kōhanga reo and playing with lots of cousins, and as he got older he was going to tangi and doing dishes, older again it was learning about history and whakapapa and no doubt it will change again.*

When asked how kaitiakitanga has changed over the years, three whānau stipulated; *Before now and up to now kaitiakitanga hasn't changed it's the people that have changed*

Of the seven kaumātua interviewed 80% felt that kaitiakitanga has definitely changed. *So has the role of being a kaitiaki. Nowadays the kaitiaki has to know the laws of the local council as well as the lore of Māori; the seasons, when it's the right time to harvest and so on.* When they were asked who can exercise kaitiakitanga, most whānau felt *they had something to offer, to achieve the desired outcomes. There are people who practice with humbleness and who can teach and share with others eg tāngata Ngākau, Māhaki for all people.*

When asked what the challenges of contemporary kaitiakitanga and opportunities are; two whānau commented that *using old, current and new methods to view kaitiakitanga demonstrated they work and will continue to work if whānau embrace these challenges. The challenge is to those who are ignorant and naive in their approach to tikanga.*

For other whānau, obligation and responsibilities was part of the environment

*It means having to go and cook for others and clean up after others, this is a way of practicing manaakitanga, helping out at the marae.*

When asked how important the marae is to the future well-being of Māori; three whānau thought it was; *Very important as this is where a lot of history about kaitiakitanga is handed down and where the hapū uses this forum and information to find better ways to enhance and continue to keep the whānau involved and informed.*

Kaitiakitanga is a big part of Māoridom; this is a system or structure that has helped to preserve the environmental sustainability and conservation of the marae, the sky, the sea, the land, the hapū and individual needs. Kaitiakitanga practice is seeing and doing, like scaffolding, following a process, those before did it like this and so I will do it like this and it will continue.

#### **Responsibility**

Two whānau reported feeling a responsibility to play a role where Mangatū marae is concerned. Everybody has different roles, each do their bit and it should be easy for the next one. One whānau felt they needed to do more. They did not see their marae activities as overwhelming.

When asked “does Mangatū reflects in some way the person you are?” nine whānau answered positively, and six of these referred to the specific cultural values and responsibilities instilled in them because of their time spent at Mangatū.

They practice tikanga in the home and don't realise it, mind you it is all common sense. No sitting on the table, no combing your hair in the kitchen. Taking your shoes off before walking into someone's house is a sign of respect.

#### Distance

Distance is a factor for whānau when it comes to whānau events at the marae. Four whānau who do not live close to the marae state that: *Mangatū marae continues to be an important place to come to.*

One whānau who visited the urupā commented: *she loved it at the urupā, it was so neat and tidy, so peaceful, thank you for keeping our loved ones nice and tidy.*

One whānau who currently lives in Gisborne wishes to move back to live before retirement, while another felt that distance was not an issue.

*It doesn't matter where Mangatū marae is; it will never change for him in terms of his life experiences it will never diminish.*

Whānau who reside away from Mangatū said they found it difficult to comment about the marae because *You have to tread carefully around the views of those who live at home, it has been said; your voice does not count, you don't live here anymore. He said because he was brought up at Mangatū, that comment did not offend him. He knows he belongs, he knows his whakapapa.*

#### Whānau Connection

Mangatū marae is a place of reconnection with known whānau, a good place to be introduced to unfamiliar whānau and an environment where people can learn the tikanga and kawa of the marae. Whanaungatanga is a natural culture process to share knowledge with whānau.

*Knowing the marae is there to be used, for their whānau, it's a place where they can come back and meet all their extended whānau, who don't even know they are related, it's getting to know who's who in their whānau.*

Whānau found it easy to reconnect after spending time away from Mangatū as they had kept in touch with their whānau living at home. Mangatū is described in virtual terms; belonging to Mangatū is different to other places.

*When he goes to another marae, he's just a visitor or tourist because he's unfamiliar to that place, what makes Mangatū special compared to other places is that it's part of him it's his place.*

An emphasis on connection to both the marae and people is expressed as something that has to be preserved and passed on. For many whānau, Mangatū marae was a place that connected them to whānau who had recently passed away, or to a long line of ancestors. It was a connection they wanted to maintain for their children.

As whānau expressed their views regarding kaitiakitanga, responsibility, distance and whānau connections it was obvious te ao Māori was being transmitted to the next generations. For example, whānau felt that it is a natural process and it happens naturally throughout the stages of growing. “There is a strong belief that there is a uniquely Māori way of looking at the world and learning” (Smith, L., 2003 p.174).

*Objective 3: Determine how te ao Māori knowledge can contribute to the future aspirations of whānau, hapū, iwi and marae.*

Whānau agreed it was important to pass on te ao Māori knowledge to the next generation. The revitalisation of Māori culture has been on the rise especially te reo Māori (Mataamua, 2006) the launch of Māori TV in 2004 placed te reo Māori in people's homes and encouraged Māori to learn their language. All of these initiatives contribute to the learning of te reo Māori and te ao Māori.

#### Challenges and Opportunities for Kaitiakitanga in the 21st Century

Priorities have changed which has impacted on the way things are carried out on the marae. Marae is about community and helping out, today because everything is westernised it's hard to work around being at the marae and continue to do other things. Whānau support and encourage their children with weekend sporting activities, life has become individualised and personalised, and the notion of supporting the marae has moved to the side.

*Instead of going to the marae to help out, lifestyles have changed the way people think i.e. busy playing sports or work commitments but mostly just can't be bothered.*

One kuia commented about when her mokopuna comes to the marae . . . *It's different now, traditions have changed, she sees it with her own mokopuna, and it's not their fault, because their parents don't bring them home enough. When they do come home, they are not taught and want to forget that they are part of what she represents.*

The urban drift and the adaption to western society have impacted on Māori in contemporary times. The importance of exercising kaitiakitanga at the tribal level has become greater to protect the cultural values and taonga.

#### Being Comfortable at the Marae

All whānau were consistent in their expectation that Mangatū marae would be there for them and their children to use, a place they can take their kids to and be comfortable, whether they were raised there or not.

*There were some whānau who said they would like to move back home at some stage for their tamariki to be able to grow up in their rohe and learn the marae tikanga and kawa.*

For three whānau in particular they felt emotional comfort was an important factor in distinguishing Mangatū marae from other places. *Their memories of the marae are full of happiness, a place where they grew up so it will always hold a special place in their hearts.*

While most whānau felt they could be more comfortable at Mangatū than other places, there were particular reasons for this. One whānau felt she could be very honest in expressing herself at Mangatū.

*She knew she was in a safe environment when she expressed her thoughts at the marae hui, the response was not a positive one, but she felt safe to do it.*

#### Sustainability

Sustainability and survivability of the marae is another important factor for our marae. Due to everyday life changes and the coming and going of young people away from marae some whānau deliberated on how to encourage them back to Mangatū to fulfil roles such as ringawera, kaiawhina, kaikōrero and kaikaranga, which are integral to the survivability and sustainability of

the marae and the prescribed steps and concept of whanaungatanga.

Two whānau said not having enough tamariki to carry on the marae traditions may be an issue? *In today's economic times the size of families has decreased; many years ago children were born every year, today it is not viable, both parents work to help make ends meet. They need to guide the tamariki and mokopuna in the right direction so as to sustain the marae for the future.*

One whānau thought another deterrent to the sustainability of the marae is ngā tāngata, ngā tāngata, ngā tāngata, will there be enough people to carry on, into the future?

The survivability of the marae into the future is te reo Māori. Te ao Māori knowledge into the future depicted for some whanau the importance of ensuring certain practices and beliefs continued to be passed to the next generations. For example, it has been identified with the blend of the western culture significant traditions from te ao Māori have diminished or are no longer being carried on through the generations and it might also be that the knowledge is being slowly watered down through the generations (Ruwhiu, 2009 p.90).

## Discussion

Māori have continued to use kaitiakitanga to protect taonga; today kaitiakitanga is not just associated with environmental management, it takes into consideration all things Māori. Mangatū is a standing, living testament to those of the past and present and a symbol for the future. In whakapapa, in dialogue and in thought, connections reflect the mountain, river and the land. Weaving people and places to Mangatū is a reference to ancestors of long ago, photos hang in the wharenui of those who have departed and ever present is the knowledge, comfort and security of belonging within this realm.

Māori culture has been transformed into a timeless culture, so that the past never disappears in the future. The *marae* is a haven away from home and is a place where Māori traditions are respected and relived.

The transfer of knowledge is significant and the presence of kaumātua and kuia on the marae is vital for the next generation. Just like they were tested so are we. As our kaumātua pass on, new leaders emerge. It is proposed the relationships between kaumātua and rangatahi be encouraged and strengthened.

The marae continues to occupy a significant role for Māori as a primary site for whānau, hapū and iwi to continue traditional ritual and customary practice. The carvings, tukutuku, kōwhaiwhai and other artwork are repositories of local knowledge, history and events. Marae have adapted and hold contemporary service delivery without interference to customary practices. Gathering for whānau usually happen at tangihanga, birthdays and weddings and there is no opportunity to share knowledge as a whānau. It is recommended a proposal to the marae to hold bi-annual wānanga; to hikoi the whenua, learn the history and events that occurred on the Mangatū marae and to listen to the artwork stories.

The significance to kōrero te reo Māori is important and relevant in the context of the marae. Marae provide the 'stage' on which these oral arts and traditional texts are witnessed in the fullest expression possible (Durie, 1995). It is proposed the marae and whānau support Te Kura o Whatatutu in their journey as a Kura Kaupapa. The marae is the last bastion to be Māori. Our tamariki are our future generation, our duty is to manaaki them in their journey and in the process, we will learn as well.



The marae world has matured into the 21st century. Tangihanga, the health of whānau, our values and beliefs are renewed and remain (Nikora, Te Awekotuku & Tamanui, 2013). The marae is a foundation for kaitiakitanga; it holds a repository of information, knowledge and wisdom. The marae is a source of knowledge about whakapapa, culture and identity. If we lay down a good foundation for our tamariki, and nurture them through our love and support, provide them with guidance and opportunity, then the next generation will be prepared for the future.

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## Glossary

Ahi kā	People who keep the home fires burning
Ātea	Courtyard - front of marae
Atua	Godly
Awhi	Help
Hangi	Earth oven
Hapū	Kinship group/pregnancy
Haukāinga	Local people of a marae
Hikoi	Walk
Hongi	Touch noses
Iwi	Extended kinship group/tribe
Kai	Food
Kaiāwhina	Helper
Kaikaranga	Female caller
Kaikōrero	Male speaker
Kaitiaki	Guardian
Kaitiakitanga	Stewardship
Kaiwaiata	Singers
Karakia	Prayer
Karanga	Ceremonial call
Kaumātua	Elderly gentleman
Kaupapa	Topic
Kāuta	Shack
Kawa	Custom

TE RANGAHAU TAIAO KI AWANUIĀRANGI

Kirimate	Chief mourner
Kōhanga Reo	Māori language preschool
Kōhatu	Ston
Kōrero	Talk, speak
Kōruru	Carved head at the apex of the marae
Koha	Gift
Kōwhaiwhai	Visual art
Kuia	Older woman
Kura Kaupapa	Primary school operating under Māori custom
Maihi	Sloping barge boards of the marae
Mana	Power
Manaia	Stylised figure used in carving
Manaaki	Care for
Manaakitanga	To nurture, to care for
Manuhiri	Visitors
Marae	Ancestral house
Mihi	Acknowledge
Moenga	Sleeping place
Noa	Non-sacred
Pā	Fortified village
Pae	Sitting area
Pae tapu	Speakers seat
Pākehā	White people
Papakāinga	Ancestral home/place
Puku	Stomach
Pūrākau	Story
Rākau	Stick
Rangatahi	Teenagers
Raupō	Bullrush
Ringawera	Cooks
Tāhuhu	Ridge beam of the marae
Tamariki	Children
Tangata	People
Tāngata whenua	Home people
Tangi	Cry
Tangihanga	Funeral
Taniwha	Water spirit
Taonga	Treasure
Tapu	Sacred
Tautoko	Support
Te Ao Mārama	The world of light
Te Kore	Realm of potential being
Te Reo Māori	Māori language
Tikanga	Protocol
Tīpuna/ Tūpuna	Ancestor
Tūpāpaku	Deceased
Tūpoupou	Elder
Tūrangawaewae	A place to stand
Tukutuku	Patterns

A COLLECTION OF READINGS FROM GRADUATE STUDENT THESES

Urupā	Cemetery
Waharoa	Gate
Waiata	A song
Wahangū	To be silent
Wānanga	Grouping together to learn
Whakairo	Carving
Whaikōrero	Speech
Whānau	Family
Whanaungatanga	Relationships
Whare	House
Whare Mātauranga	House of knowledge
Wharekai	Eating house
Wharenui	Sleeping house
Whāriki	Mats
Whenua	Land

*Te Rangahau Taiao  
ki Awanuiārangi*

CHAPTER EIGHT:

**SHAPING A SUSTAINABLE ENVIRONMENT: THE  
CHALLENGES FACING IWI FROM WATER MANAGEMENT  
PRACTICES ON LAKE ROTOITI.**

*Teinakore-Curtis, F. (2015)*





**FRANCES TEINAKORE-CURTIS**

Ko Ngāti Rongomai te iwi  
Ko Te Arawa te waka  
Ko Te Pikikotuku te tangata  
Ko Rotoatua me te Rotoiti i Kite ai a Ihenga te moana  
Ko Matawhaura te Maunga  
Ko te Awa i Takapuwhaia te awa  
Ko Tutehoronganui te taniwha  
  
Ko Frances Teinakore-Curtis tōku ingoa

## Abstract

The intent of this research was to examine the challenges facing local iwi around Lake Rotoiti from Water Management practices. For many years the local iwi used significant land marks to assist them in understanding the water levels and tide flow. The lake in days gone by was abundant with kai moana that the Koeke (elders) of Ngāti Pikiao, Ngāti Rongomai and Ngāti Hinekura often used as their 'kai cupboard', appreciating what Tangaroa gave and always returning the surplus of food back to the Lake.

This chapter explores the changes in water management practices over time and assesses the present ability of the local Iwi to meaningfully engage with freshwater. A description of a Tikanga Māori approach to freshwater is outlined in order to understand the Māori assertion to ownership of freshwater within its own legal paradigm. Furthermore, this chapter sets out to discuss the impacts made on Māori by the changing Water Management practices. Māori need to be included in environmental practices and management through consultation and decision-making processes.

## Introduction

*"Ko au te awa ko te awa ko au: I am the river and the river is me"*

Lake Rotoiti, one of the group of Lakes in the Rotorua District was formed by volcanic activity within the Taupō Volcanic Zone in the central North Island, New Zealand. It is approximately 14km long and of variable width of less than 3.5km (Spigel, R. H., 1989). The full name of Lake Rotoiti is Te Rotoiti-kite-ā-Īhenga, which links it to Īhenga, the early ancestor from the Te Arawa canoe, who is credited with exploring the lakes district. The lake is graced by Matawhaura, a forest-covered mountain at its eastern end.

Rotoiti is really two lakes in one. The eastern part sits in the north of the Okataina caldera (volcanic depression), and has many hot sulphur springs. The western half - a drowned valley, Te Awa-i-Takapuwhāia - was formerly an outlet for Lake Rotorua. The two lakes today share an outlet at Rotoiti's western end. A major geothermal heat source is associated with a hole in the main eastern basin that has a depth of 120 metres and a width of 60 metres. There are also high temperature Geothermal springs that occur along the south-eastern lake boundary (Cole and Nairn 1975).

Because of the lack of Kaitiakitanga being exercised over Lake Rotoiti, in part due to the exclusion by statutory bodies to allow Te Arawa iwi to help make informed decisions regarding the Lake's health, the last 40 years has seen a steady decline in the water quality.

In 1982 the Okere Gates were created by the Bay of Plenty Regional Council (BoPRC) and a rock ledge was blown up to accommodate the Gates. A diversion wall was also built in 2008 to re-direct the water from Lake Rotorua down the Ohau Channel and the Okere Arm out to the Kaituna River. This has seen a decline in water quality and has had a negative impact on fisheries and tourism, and their associated revenue for the district (Environment Bay of Plenty, Rotorua District Council, Te Arawa Lakes Trust 2009).

Over time the moana has been slowly depleted of its kākahi, kōaro and inanga as rainbow trout had been introduced into the waters of Lake Rotoiti, and become the predators of the kai moana (Blair, J. M., Hicks, B. J., Pitkethley, R., & Ling, N., 2012). There has been a decline in water quality associated with discharge of nitrogen and phosphorus from land use activities and both lakes are now degraded and suffer intermittently from algal blooms.

Furthermore, BoPRC the managers of the Okere Gates control the water levels in the lake. They have been charged with managing the lake levels to the satisfaction of Ngāti Pikiao/ Ngāti Hinerangi, the Rotoiti Ratepayers Association and the public of Lake Rotoiti. This has become detrimental for a few of the Māori land and homeowners, as they have had to vacate their homes attributed to high water levels and continual flooding. In addition to this the local Marae have been impacted in that the Lake water being pumped into the water tanks to be used for cleaning and drinking is at times undrinkable.

The cultural impact that this has on local iwi including Ngāti Pikiao and Ngāti Rongomai are far reaching. Their values of mana (authority), mauri (life force), tāonga (treasure), whakapapa (traditional relationships) and tikanga (rules, methods) are severely undermined as they are faced with challenges to remain kaitiaki (Bennett, 2010).

### Kaitiakitanga

The Rotoiti Lake is of fundamental importance to the Te Arawa iwi. For generations Ngāti Rongomai - a hapū (subtribe) of Rakeiao along with hapū of Ngāti Pikiao (the descendants of Pikiao I) and Ngāti Hinekura (the descendants of Hinekura), have safeguarded the realm of Tangaroa (an eponymous ancestor of tangata whenua and guardian of the sea). Their understanding of Kaitiakitanga is vast and their practice of it has been long standing.



*A view of Lake Rotoiti and Matawhaura Maunga.*

Marsden and Henare (1992) define the concept of Kaitiakitanga as conservation, customs and traditions, including its purpose and means through Rāhui; a process where the depletion of a resource and pollution of the environment was protected through prohibition of the utilisation of a supply in order for regeneration of resources. Once this process was complete, the Rāhui was lifted. This was a form of farming rotation and gave a continual steady source of supply and ensured sustainability of the resource (Williams, 2006).

As Kaitiaki - guardians, protectors, and conservators of a natural and environmental resource - people are an integral part of the natural order and the recipient of Papatūānuku's bounty. As a person has social obligations to his whānau, he is also obligated to mother earth and her whānau through the promotion of their welfare and well-being (Marsden and Henare 1992).

### Tikanga Māori: A Māori Legal System

Tikanga Māori is the foundation of the Māori relationship with freshwater and plays a pivotal role in understanding the Māori claim to ownership of freshwater. There are three fundamental principles that guide a tikanga Māori approach to freshwater: (1) an identity bestowed upon Māori by the ancestors that shape a Māori Worldview; (2) a value system suitably designed for Māori; and consequent control that is a product of the legacy left behind by ngā tūpuna (ancestors) and (3) duly adopted obligations guided by identified values (Mead 2003, p.273).

Prior to the arrival of Pākehā, Māori were the undisputed managers of the natural resources including land, air, and water. The governance of these resources was dictated by whakapapa, tikanga and kawa. Within each territory or region, land was divided between iwi and within iwi, between hapū and within hapū to the different whānau. Harbours, rivers, streams, lakes and coastal areas were also divided in the same manner. Although land and water may have been under tribal ownership, each hapū had territorial rights over specific areas that they 'exclusively maintained' (Firth 1959, p.378).

Whānau and individuals had rights to certain sections, however they could not make any changes that would massively effect the section's ownership without the approval of the entire hapū. In some cases, the hapū needed to consult with the iwi.

Dr Kepa Morgan's report (2014) on Sustainability Assessment of Rotoiti and Rotomā Sewage Project signifies the mana, rangatiratanga and kaitiakitanga of the different hapū living on the shores of Lake Rotoiti through the following extract:

*"Each lake had its own set procedures and protocols which all were required to adhere to. In Lake Rotoiti for instance, the stretch of lake-shore from Koro-ki-te- Wao to Te Tawa was the established territory of the Ngāti Tamateatuatahi. These people took kōura from the area and from that area only and never any other part of the lake. The Ngāti Rongomai had their own lake-shore territory which extended from Hingarae (Ruato) to Tapuaekura; no more and no less. In a similar way was the whole lake-shore divided and shared amongst all the hapū of Ngāti Pūkiao - Ngāti Te Takinga, Ngāti Kawiti, Ngāti Hinekura and Ngāti Te Rangiuuora."*

### Background to the study

On 5th July 2012 members of the Ngāti Pūkiao Koeke Group and Environmental Committee and Rangatahi (youth) of Ngāti Pūkiao set out on a one-day Launch expedition hosted by Bay of Plenty Regional Council (BoPRC) to (1) inspect the Lake Levels and Beach Width of Lake Rotoiti in a bid to make comparisons of the lake levels (and to find reasons for their decline in water levels) from 2008 to 2012 and (2) discuss the build-up of nutrients in Lake Rotoiti.

The Koeke/Kaumātua (elders) were an integral part of this excursion due to the knowledge they possessed. Many accounts were given of how the Lake was formerly the 'playground and kai cupboard' for many of the elders present. One of the local Koeke and significant elder described how a rock ledge that sat on either side of the outlet entering towards the Kaituna River was sighted as the landmark for the water levels for the Ngāti Pūkiao people. The tamariki (children) used this rock as their playground and knew to raise the alarm with the 'old people' so that

they all could go to higher ground if the rock was totally submerged by water as this meant much flooding was to come. Bountiful amounts of Kai moana such as kākahi, kōura, inanga and kōaro were part of the kai basket that was part of the sustainability of the Ngāti Pīkiao and Ngāti Rongomai Iwi (Stafford, 1967). They knew only to take their 'share' of kai moana, and any extra kai that had been caught must be given back to Tangaroa so that it may be replenished.

### Purpose of the study

The overall aim of the study was to identify and evaluate the challenges facing Iwi from Water Management practices on Lake Rotoiti.

The research was based on two main motives:

- The impacts on Māori by the changing Water Management practices as water is a taonga
- That Māori have a values base that embeds itself into environmental protection: however, Māori need to be included in environmental practices and management through consultation and decision - making processes.

A complimentary approach of Kaupapa Māori research and qualitative research techniques and processes were applied. Kaupapa Māori research is a positive, innovative, counter-hegemonic force which seeks to validate and legitimate Māori 'voice' and 'ways of knowing' through a research methodology constructed for Māori within a Māori context and at the control and conditions of Māori, which is the aspiration of having control over one's own life, holistic well-being and cultural identity (Smith, G., 1990).

It legitimates Māori epistemology which is meaningful to Māori and seeks to empower and honour the research participants by ensuring that they have access to the research and their intellectual property, which helped shape and inform the research project (Smith, L., 1992). Kaupapa Māori research is centered in Māori reality and upholds the Mana and Integrity of the participants, where the concerns and needs of Māori are the focus (Cram, 2009; Pihama, Cram and Walker, 2002).

The research involved two distinct components; a case study approach and in-depth facilitated conversations.

### A Case Study

A longitudinal interpretive case study approach was adopted to review Ngāti Pīkiao experiences and council decisions appealed to the Environment Court. This provided an opportunity to examine a unit of human activity embedded in the real world, and in a unique context (Gillham 2000, p.1). Data for the case study came from a range of resources including minutes from meetings, newspaper articles, a range of stakeholder meetings, policy documents and interviews with a selected number of participants. Participants were interviewed from a variety of organizations who are involved in the protection of Lake Rotoiti. Follow up interviews were undertaken to further clarify points or to probe insights

to gain further understanding and formulate an overall picture for the case study. Interview transcripts that were utilised in the study were sent out to those who requested them, after their interview, to verify that they agreed with what was recorded. All data collected was stored in a case study database. The creation of such a database was for security reasons and provides a source of secondary data for future researchers (Darke, Shanks, and Broadbent, 1998; Yin, 1994).

### In-depth Interviews

Six in depth interviews were conducted with participants. The interviews gained detailed information related to Lake Rotoiti; its location, changing water quality, water levels, types of kai collected and consumed, and other factors. The interviews were based on open-ended questions to ensure the key questions were appropriately addressed. The interviews probed deeply into the personal experiences, thoughts and feelings of both koeke and pakeke participants. The interviewees were encouraged to think about their relationship with the lake and their uses of it from their childhood, to adolescence and then to the present day. This provided data on the changes to the Lake environment through the water management practices and the emergent issues seen as potentially impacting health and well-being as perceived by the individuals.

### Ethical Issues

This study adhered to the principles of the Treaty of Waitangi and Māori ethical processes guided all aspects of this research. Initial consent to conduct the research project and the participant interviews was obtained from the Rakeiao Marae Trustees Committee. The research involved a process of relationship-building with the local community. The principle of *kanohi ki te kanohi* meant it was important for to consult the hapū prior to conducting the research, and attend marae meetings. Informed consent was obtained from all participants where they were informed of the purpose of the study and possible uses of the research (e.g. conference presentations and journal publications). *Koha*, in the form of refreshments and kai was offered in return for participation. Participants were given the opportunity to recheck or correct information once transcribed or withdraw information up to one month after data collection. A summary report of the findings was given to the Rakeiao Marae Trustees Committee and the Ngāti Rongomai Iwi Trust.

### Ngāti Pīkiao Case Study

*Me hoki whakamuri kia kitea ai me pēhea ai te haere whakamua - Look to the past to determine the future*

The case study findings outline how councils have failed to honour their obligations to Ngāti Pīkiao under the Resource Management Act (RMA). The case study focused on the changing water management practices of Lake Rotoiti and the consultation and decision-making processes by local Council with Iwi over the water. The case study highlighted the attitudes held by those who sit in judgement and illustrated how Ngāti Pīkiao concerns were ignored, and rights and aspirations for the use of ancestral lands and space denied, during the Iwi's time of challenging decisions made by councils.

### Background

The first sewerage scheme for Rotorua was constructed in 1891 covering the then Central Business District (Rotorua District Council, 2013). Between 1926 and 1969 the network was expanded and wastewater was pumped to a series of large tanks discharging into the Puarenga stream via sand filters. Subsequent upgrades on the Wastewater Treatment Plant (WWTP) were completed from 1973 to the current time to continuously improve effluent quality and comply with resource consent requirements. During the early years of Land Treatment System (LTS) irrigation, nutrient leaching was minimal. However, from 1993 to 2010 the amount of nitrogen leaching has steadily increased to around 40 tonnes per year in 2010. Phosphorus leaching also followed an increasing trend from 2004 to current date.



### Description of Lake Rotoiti/Rotomā District

The Rotomā main area is the community around the state highway with 232 occupied houses. Doctors' Point has 20, and there are 43 vacant sections at Rotomā and 4 at Doctors' Point, a total of 47 vacant sections and 252 occupied houses and 2 community facilities, the school and the fire station. There are 4 commercial facilities, the shop, the café, the fuelling station and the camp ground, and one school and a public toilet at the bottom of the Whakatane hill.

For Rotoiti there are 414 occupied houses from Curtis Road down to Morehu Road and 113 vacant sections. Rotoiti has 7 marae and 2 community facilities, the rugby club and the school. Altogether there are 666 occupied houses for the whole scheme and 160 vacant sections or 826 potential unsubdivided sections.

### Lake Rotoiti/Rotomā Wastewater System

The current wastewater system (consisting of septic tanks and grinder pumps along the Lake Rotoiti and Rotomā areas) was originally designed to cater for 900 homes. Depending on how close the homes with septic tanks are to the lake, determined the time that it would take for the nutrients in the tanks to flow into the lake - in turn reducing the water quality.

Unsustainable amounts of nutrients from town sewage and agriculture have historically entered both Lakes Rotorua and Rotoiti from septic tanks and from farming (eBOP, RDC, TALT, 2009 p.8). These nutrients are now within the bottom sediments of both lakes. Ecological process within the lake can result in these nutrients being released into the water column several times a year which has major effects on water quality. This process is referred to as the internal loading in the lake.

Gisborne Point in Lake Rotoiti, as identified by BoPRC (2011) indicates that some contamination is occurring from septic tanks, but it is only detected at low levels in shallow groundwater and the near-lake environment. Faecal bacteria levels in shellfish show some contamination is occurring but this may be sourced from waterfowl as well as on-site wastewater systems. Any faecal contamination arising from septic tank effluent from the Hinehopu community appears to have little effect on the bathing quality of the adjacent waters, but may affect shellfish. Two surface water inflows show low level contamination which is likely to emanate from on-site wastewater systems. Nutrient concentrations from surface inflows are at low levels compared to other Lake Rotoiti inflows.

### Lake Rotomā Water Quality

The water quality of Lake Rotomā adjacent to lakefront communities remains excellent.

However, the lake has been showing signs of increasing nutrient loading. Reticulating septic tanks has been identified as one of the options to reduce nutrient input to the lake. The greatest contribution of nutrients to Lake Rotomā currently comes from disposal of wastewater in the catchment, rural land use (sheep and beef grazing) and rainfall (BoPRC, 2009, p.5). Nutrients may have increased significantly over the last 15 years. About 14% of the nitrogen load and 34% of the phosphorus load entering Lake Rotomā is derived from wastewater from the Lake Rotomā community.

## The Proposal

In 2010 the Rotorua District Council (RDC) applied for Resource Consent to BoPRC to build a Wastewater Treatment Plant (WWTP) on Māori owned land that RDC would attempt to lease for up to 25 years. The Rotoiti/Rotomā WWTP proposal angered the Ngāti Pikiao iwi, especially koeke (elders). The proposed location of the WWTP would not only allow effluent to be piped back into the lake, but the pipes would be laid along cultural sites of significance in this case the ana (caves) along Lake Rotoiti where prominent ancestral koiwi (bones) lay. This specific area of Rotoiti and Rotomā, recognised in Ngāti Pikiao history through waiata (songs), pūrākau, narratives, and poetry as an important site of spiritual, cultural and historical value to Ngāti Pikiao, at the stroke of a pen, would become the repository of human waste.

The consent was approved January 2011. In addition to gaining resource consent for the WWTP, council needed to be pragmatic in completing a Cultural Impact Assessment (CIA) on the area in accordance with part 2 of the Resource Management Act (RMA). However, despite having a Cultural Advisor employed fulltime with council who could liaise with Ngāti Pikiao iwi to choose a cultural expert, council decided to seek advice from an Iwi Cultural Advisor from another rohe (region). Iwi had had discussions with Council and were told that they had several weeks to choose an appropriate person, and that the council would then consider that person as the appropriate appointment for the cultural impact assessment.

However, at the time this was communicated, the Council had already contracted the services of an Independent Iwi Cultural Advisor. Conversely Ngāti Pikiao had sought the services of Dr Kepa Morgan as Iwi Cultural Advisor to undertake a CIA of sites of cultural significance and the mauri of the water around the area of the potential WWTP.

## The Appeal

Due to a huge lack of inconsistencies of proper conduct by RDC in obtaining a potential landsite for the WWTP and carrying out a suitable CIA agreed to by Ngāti Pikiao and Ngāti Makino, an appeal to the Environment Court was put forth.

The key issues in the appeal were premised because the Resource Consent application had:

- a. Failed to adequately provide and recognise the relationship of Ngāti Pikiao with their ancestral lands, waters, sites and taonga.
- b. Failed to adequately provide for the kaitiakitanga of Ngāti Pikiao.
- c. Did not take into account the principles of the Treaty of Waitangi.
- d. Is inconsistent with Part 2 of the RMA.
- e. Did not promote the sustainable management of natural and physical resources.
- f. Failed to avoid, remedy or mitigate the adverse effects of the Application on the environment, particularly the adverse effects on Ngāti Pikiao.

Moreover, the Application:

- a. Is contrary to the objectives and policies of the relevant plans.
- b. Failed to assess the effects of the activity on the cultural and spiritual values and interests of Ngāti Pikiao (Ngāti Pikiao Environmental Society, 2011, p.2).

## The Evidence

The hearing in the Environment Court was set to begin 7th July 2012. All tangata whenua submitters informed RDC that they opposed the application on cultural and spiritual grounds and on the adverse effects to kai moana. Other issues raised by tangata whenua such as Ngāti Pikiao related to the Treaty of Waitangi, principles of consultation and active protection, the presence of wāhi tapu, especially the ana (cave) that houses the koiwi of a prominent Ngāti Pikiao ancestor Te Haukeka, the importance of a Cultural Impact Assessment, the suitability of alternative sites, the treatment and disposal system and the fact that Māori development was constrained with the wastewater treatment and disposal in place.

Council were prepared to severely undermine Ngāti Pikiao by contracting an Iwi Cultural Advisor from outside of the region and had ignored Ngāti Pikiao's request to have Dr Morgan as the Cultural Iwi Advisor. After a week-long inquiry, the Environment Court found in favour of Ngāti Pikiao (Main Appellant) and Ngāti Mākinō (subsequent Appellant). It was the Environment Court's view that the RDC had "misled both parties and the Court on several important matters." The judge was critical of the council's consultation process for the project and awarded legal costs against the council of \$65,000 in favour of Ngāti Pikiao and \$50,000 in favour of Ngāti Mākinō (Malcolm, 2013).

## The Outcome

At the beginning of 2014 a Steering Committee to consult on and guide the process of developing wastewater treatment options for the Rotoiti/Rotomā District was established by RDC. The Committee named Rotoiti/Rotomā Sewerage Scheme Committee (RRSSC) consisted of representatives from RDC, BoPRC, and Rotorua District Councilors, Iwi representatives that were mandated by their Marae and iwi in the Rotoiti/Rotomā District, Ngāti Pikiao Environmental Society, Te Arawa Lakes Trust (TALT), Ministry of Health (MoH), and Rotoiti and Rotomā Ratepayers Association representatives. A Technical Advisory Group (TAG) was also established to discuss and manage the technicalities of the various wastewater treatment options that were put to the RRSSC by RDC. They consisted of engineer consultants and water quality scientists who work in the field of wastewater treatment plant engineering and water quality. They were responsible for reporting back to RDC the best-fit solutions and/or options for wastewater treatment in the Rotoiti/Rotomā district. Dr Kepa Morgan became a member of the TAG group through his expertise in engineering which included an indigenous knowledge perspective and knowledge and experience of the Rotoiti/Rotomā area and his affiliation with the iwi.

The committee heeded the lessons learnt from the past case won by Ngāti Pikiao and Ngāti Makino against RDC. The steering committee took the view that all stakeholders within the concerned districts would 'have a voice' at the RDC negotiating table. Each stakeholder group was delegated the task of reporting back to their people regarding the preferred wastewater treatment options. Public consultation meetings were had by the RRSSC in the Rotoiti/Rotomā area to discuss the options and to answer the community's questions and concerns. Iwi representatives were given the responsibility of conducting and completing a CIA for RDC and the RRSSC.

The iwi reps engaged Tait Wichman, an independent engineer with over 20 years' experience in the engineering industry to help solve the technical issues of the wastewater options. After scrutinizing all the information at hand and undertaking field trips to various Membrane Bioreactor plants (MBR) and WWTPs, the iwi reps assisted by Tait Wichman prepared a CIA statement for the RRSSC that stated the iwi's position.

The statement affirmed that:

*The decision on preferred option has recently gained progress as a result of learning activities undertaken by Iwi, made possible in part by RDC support and the time extension provided by the Ministry of Health. Iwi wish to thank RDC, the RRSSC Chair and members of the RRSSC for their patience and understanding, which has allowed them to progress and arrive at an informed and confident decision (T. Wichman, attached statement to pers. email comm. Nov 2014).*

The iwi reps also discussed the desire not to have the reticulated system being piped back to Rotorua Township. Iwi did not want pipes to go through wāhi tapu as the expected pipeline was to be 20km in length. Secondly, being Kaitiaki of the land, the very thought of leaking sewage back into the land and eventually into the lakes was something that the different iwi could not fathom. Several the RRSSC committee members and the stakeholder groups that they represented were still very much in favour of the piped sewage into Rotorua option. Much of their thinking was based on 'flush and go' whereby once solids were flushed down the toilet, the owner of the property would not have to think about it anymore.

The Steering committee, who were all representing various stakeholder groups could compromise to a large extent so that each groups' needs would be heard and met. The Biolytix wastewater treatment unit was the preferred option that Iwi representatives had advocated for.

## Findings

*Kei te ora te wai, kai te ora te whenua, kai te ora ngā tāngata*  
*The water is healthy, the land and the people are nourished*

In years gone by, many of our koeke used the Lake as both their playground and their kai cupboard. Bountiful amounts of Kai moana such as kākahi, kōura, inanga and kōaro were part of the kai basket that was part of the sustainability of the Ngāti Pikiao and Ngāti Rongomai Iwi. However, they knew only to take their 'share' of kai moana, and any extra kai that had been caught must be given back to Tangaroa so that it may be replenished.

Over years the water quality has deteriorated and the moana has been slowly depleted of its kākahi, kōaro and inanga as rainbow trout had been introduced into the waters of Lake Rotoiti, and become the predators of the Kai moana (Blair et.al, 2012). The Ngāti Pikiao and Ngāti Rongomai peoples' relationship with Lake Rotoiti has been impacted by the changes in the water quality and its deteriorating health. Although the implications that result from the data are subtle, it is evident that the changing water management practices of the lake have attributed to the water decline.

The koeke in these interviews have seen the changes first hand and they have directly expressed the failure of these changes to properly assert themselves spiritually and culturally with the lake today. Six questions were developed out of the Ngāti Pikiao Case Study and the subsequent RRSSC committee that followed on from the Environment Court decision. Questions were asked of six koeke. Each question and participants responses are explored below. These findings help inform the next steps towards environmental sustainability for Ngāti Pikiao iwi.

*Question One - What was the Lake water quality like when you were young in comparison to today?*

This question was asked to ascertain the recollections of the koeke and pakeke on their experiences with the Lake; to encourage the older generation to recall changes that have impacted their relationship with the water.

*The water quality was awesome...we used to rama kōura just go along the shore line at Te Takinga street, where the pikiao club is, along the shoreline there, my mate and I used to do that with our torches and rama for kōura using a fish and chips yeah scooper or other than that we used a stick and just lie on the bank of the Ohau channel. My mum used to thread all these worms, then she'd make a bundle and oh gosh you know, the kōura would just grab onto the worms and...we'd just pull the stick up and we'd catch one after the other You know the methods we were using were old fashioned but by crikey they worked, and not only that but it was good fun, you'd sit out there in the dark for ages.*

#### Māori health

Question one attempts to describe how kai is the glue that brings the whānau and hapū together. It provides a sense of identity and community and recognizes the knowledge and values that were used by the iwi during the collection of kai moana and the use of the lake as a playground. With the feedback from koeke about their experiences on the lake, it is important to know that the koeke are 'intellectual capital' for the iwi as they hold critical knowledge of the lake and can make accurate environmental assessments with the changes of the water quality and the abundance of kai moana many years ago. Their observations of how the lake has deteriorated over time and not being able to collect the amount of kai moana impacts our cultural survival physically, mentally and spiritually.

*Question Two - Did you see any changes in the water level or water quality as time went by?*

Māori have always seen themselves as Kaitiaki of the land and ecosystem. Roberts, Norman, Minhinnick, Wihongi, & Kirkwood, C. (1995) argue that kaitiaki is a big word in that whakapapa (genealogy) and tika (acting and behaving correctly) encompass kaitiaki through the principles of Atua, Mana, Tapu and Mauri. Therefore, kaitiaki means to literally look after one's blood and bones.

*Well I went away and came home in '89 and the weed was in there and it was just becoming worse, I mean it was alright when we had the indigenous weed, our own weed... that was alright because the sunlight used to get down to the bottom, we didn't have this kind of pollution but the people started throwing in all other types of weed. Invasive weeds. Then the bottom was just a mess and of course the deeper you go.... the worse the weed and that was the problem why we had to give up putting out our tau. Dad used to come home and oh god he was distraught, because we couldn't get any kōura and he knew what the reason was. It was because the water had changed, it had become paru, and it was those weeds.*

#### Changing of the water

With the degradation of the water quality came the growth of algae bloom. This weed was produced through land use of dairy farms which are very common around Lake Rotoiti and

Rotomā. Much of the nitrogen and phosphorus from the land seeped into the lake changing the water quality. This has impacted the way that iwi interact with the water through the practice of Kaitiakitanga and how they use the lake for gathering kai and swimming in. However, although environmental degradation and fragmentation of the ancestral landscape have been main contributors to restricting the practice of Kaitiakitanga, maintaining a strong connection to the local environment remains a high priority for Māori communities (Matunga, 2000).

*Question Three - Have the changes in the water quality and water level affected your whānau and hapū? How?*

This question was asked to establish the reasons for the changes and to discuss if any, the impacts made on whanaungatanga (relationships) between different whānau and hapū and how they interact with one another with the decline of different kai available in the lake.

*When they made the Weir (Ohau Weir), where the kids swim, you know where it's very narrow and they made that sort of like a gate way for the boats to get through, the inanga come and they hit that, the wall and then they return and go backwards into Rotorua Lake so it's hard to fish for them, we hardly get them anymore down our end....and see, you've got water levels now, they are manmade which altered the whole way of how the inanga come through...and when they started dredging the Ohau channel that's another thing its affected by ...and then they start taking off the shingle bottom and that throws the inanga out as well because the environment is changing. That's been really frustrating for our whānau to keep looking for kai. That used to be our favourite pastime.*



*Lake Rotoiti 2009 - showing the wall built to divert water from the Ohau Channel (and therefore Lake Rotorua) down the Kaituna River, hopefully bypassing Lake Rotoiti.*

### The loss of Manaakitanga

Degradation of the lakes has meant that over time iwi have been unable to properly collect and share kai with other whānau and hapū of neighbouring areas. Having the ability to manaaki visitors by supplying food resources through one's collection of kai in their own hapū boundaries gave Māori a huge sense of ownership and identity and the ability to maintain community ties (Durie, 2004, p.2). Conversely the inability to manaaki guests and maintain whanaungatanga can lead to cultural loss. It is the relationship that iwi have with the environment that has extended over many years. It is a unique relationship in that the natural resources are often regarded as



tūpuna (Whangapirita, Awatere & Nikora, 2003). Such resources represent the mana and mauri of the iwi, hapū and whānau, and are central to their tribal identity as well as their physical and spiritual wellbeing.

For Māori, land is a tūpuna, a source of tribal identity and whakapapa, and as such binds human relationships and is essential for spiritual growth and economic survival (Durie, 1998). Whakapapa is the basis for hapū membership (Mead, 2003). Thus, whakapapa connects the people of the hapū to one another and to the land. Whānaungatanga has its basis in whakapapa, and refers to the fostering of relationships amongst kin. Whānau relationships bring mutual obligations and responsibilities; people expect to be supported by their relatives, wherever they may live (Mead, 2003).



Lake Rotoiti - 1920s

*Question Four - What kai did you gather around the lake when you were young as well as today?*

Mahinga kai (collecting seafood) activities is an important component to hapū whakapapa. The right to practice cultural activities such as tau kōura (putting out kōura gathering nets) was an important pastime for the koeke and pakeke of Ngāti Pikiao and Ngāti Rongomai to retain ahi kā rights (iwi who keep the home fires burning) to the area. The current generation aspire to perpetuate ahi kā as part of preserving Ngāti Pikiao culture and identity today.

*We used to see when the whitebait or inanga were running, it was just a black mess. And it was just so thick and long along the Ohau channel and it was just continuous. And that was from August onwards. We used to catch them for kai, that was when we were young ... my mother was very strict on what amount we took and how we couldn't waste any inanga, save it for the next day, just get what you need. Our old people, they knew how to conserve, they weren't greedy and another thing you see we only had our own areas we stayed within our boundaries, each hapū had their own traditional boundaries. We could get five bundles, seven bundles of kōura back then. We'd have enough for the marae to have a big hākari. But we can't do that now. Coz there's not enough kai in the lakes, when they installed the gates it didn't balance the water out and it created those weeds.*

### Mana Whenua roles and responsibilities

Morgan (2014, p.6) has suggested that having mana whenua rights to reserves and sections of waterways is an essential part of iwitanga and hapūtanga (tribal hapū identity and mana) of Ngāti Pikiao. The ancestral connection is constantly reinforced through traditional practices and maintains the relationships between the people, the land and the water. Water provides the connection between the past, the present and the future. These relationships reinforce that water catchments are a natural geographic partition for management of the environment. Ngāti Pikiao has maintained ahi kā and mana whenua rights and responsibilities, and continued to live within their ancestral rohe in accordance with their customs and traditions.

The lands are taonga tuku iho (treasures handed down from the ancestors) and as such, the current generation are merely kaitiaki for these lands and lakes to ensure that it is passed onto future generations intact, with the stories, customs and traditions to preserve our iwitanga/hapūtanga, tikanga and mana (Morgan, 2014). Kaitiakitanga is the role of mana whenua in sustaining mauri and upholding their customary responsibilities. It is for those who hold mana whenua (authority associated with possession and occupation of tribal land) status to exercise kaitiakitanga and protect the mauri of significant resources (Ministry for the Environment, 2003a). The koeke and pakeke in these interviews discussed their roles with the lake and there are subtleties that they allude to that help one to infer that they were Kaitiaki and had mana whenua over that particular rohe. Central to their role of having mana whenua rights was the notion of being responsible to ensure that kai moana was suffice and readily available for consumption.

*Question Five - What changes to the habitat have you observed and how has this affected you?*

Kai gathering unites the whānau and hapū, and it provides a sense of identity that also serves as the vehicle for the transmission of values and knowledge. So, the intent of the question is to ascertain whether these participants have been affected and what that looks like.

*Well the kōura prefer to be in a dark area. But there aren't as many spots anymore for them to be in because of the changes.... So over here you have the weed, and over here (at another spot on the table) you have a lot of rocks, they're big rocks. You know the corner where my place is, they had to use dynamite it to get rid of all of the big rocks so that they could build the road. Well the rocks are in the lake, its coz of the road works. So, the kōura loved that and they survive under those rocks, they hide from the shags, they hide from the trout. Like if there were trees they'd be there. Those places now, no one goes Rama in those areas because of the weed, coz the stocks are out there...so it's hard to get out there to rama because the habitat has changed.*

### Changes to the habitat

Morgan (2011) asserts that Māori perceive many waterways as being degraded because of inappropriate use and development. In the last two decades, Māori have been seeking greater recognition for their cultural beliefs, values and practices. They are concerned that a failure to recognise their cultural values and customary and Treaty rights will constrain tribal development and could damage many of the foundations of their culture and identity.

This concern has surfaced in many forums in recent years, particularly resource consent hearings. Here Māori, as kaitiaki, are obligated to identify the effects (positive and negative) of resource use

and development on their culture, beliefs, values and practices. With the changes to the habitat due to the pollution of the waterways through sewage and nutrient loading, it could take at least seven years for the kai moana to fully recover (Morgan, 2011, p.52).

*Question Six - Are you happy with your current level of access to kai and water use that you value? What are the main barriers that you face today?*

Participants were asked if there has been an impact made on them while in the process of collecting of kai moana in Lake Rotoiti including; are there barriers to gathering kai moana, and what impact does this have on whanaungatanga and manaakitanga of hapū and iwi with one another?

*The numbers of kōura should be greater. So, it's not fished every day. So, you know there will always be kōura unless something else drastic that's going to kill them off. So, put all that together and it does make sense. If you put a tau down, plenty of them then you should be able to still get kōura, just not the same amounts. The barriers are the paru that's still in the lake. The sewage from the different septic tanks haven't helped. But the council is trying to clean up the lakes, they just need to keep listening to the people.*

*I'm on the Kōmiti whakahaere for the Te Arawa Lakes Trust and we're in discussions with BoPRC and we've got funding to clean up the lakes. Putting pipes through the lake for a reticulation scheme is not right. It'll change the mauri of the lake and that's not what our iwi wants. If they do that, it'll stop our people from...from going to fish. They'll just go to pak n save. Our traditions will be lost. ... I've taught my son to do tau kōura and he's teaching his son. We used to have a lot of kōaro too but they've now depleted, because the trout eat them. The trout eat them, the trout eat the kōura, and if there's eels, they love kōura. Especially when they're a soft shell kōura.*



Lake Rotoiti - 2015

### Lack of rights to decision-making

The current approach to water allocation treats water in such a way that is inconsistent with the relationship that Māori have to the resource and their role of caring for and protecting it. Water management practices over time treat water as a commodity that can be divided, mixed, and transferred which means that traditional associations with, and ways of managing water are lost (Ministry of Environment, 2003a).

The intent of RDC via BoPRC was to build a Wastewater treatment plant where eventually the para (effluent) would end up in the lake and down through the Waitahanui stream. Pumping sewage effluent into the lakes is offensive on medical, social, spiritual and cultural grounds (NIWA, 2010). If Ngāti Pikiao had not sought an appeal to the Environment court for the RDC's Resource consent, the cultural and health impacts would have been substantial.

The cultural effects associated with human waste was described in the Waitangi Tribunal report (1984) WAI4 as follows:

*There is a psychological revulsion from human waste that is probably common to all the peoples of the world. Mr W R Cameron, Chief Public Health Officer in the Ministry of Works and Development, spoke of this when he said that "...animal and in particular human wastes have always been considered to be revolting..."(Waitangi Tribunal, WAI4 Kaituna, p.14)*

To have sewage pumped into the very heart of the area that iwi gather food from, would make a huge impact on tribal mana and identity.

### Conclusions.

It is evident in the participant interviews and the Case Study that to achieve greater environmental sustainability, the Crown and the local Government agencies it empowers must be willing to relinquish decision making power and empower tangata whenua, acknowledging the partnership that was forged in the Treaty of Waitangi. If a paradigm change is to occur, it will be only by decolonising our nation's notion of power to move away from neo-liberal models of operation (Hutchings 2006, p.101). Once the mana of tangata whenua are restored and an equal partnership between the Crown and iwi is established, then the door will open to restore the flow of freshwater resources, as based on tikanga Māori and mātauranga Māori values.

A paradigm shift is needed. This shift needs to change the way that people think; the validity of Tikanga Māori and Mātauranga Māori must be acknowledged, and its values should be at the centre of environmental decision making and relationship building. Changing the awareness of non-Māori poses the biggest challenge in moving towards greater sustainable management.

Indigenous cultures all possess the necessary traditional ecological knowledge, values, and principles for sustainable management, but we must first recognise post-colonial approaches and adapt strategies like Tikanga Māori and Mātauranga Māori to work towards sustainable futures before that knowledge can be meaningfully recognised and implemented.

Mead (2003, p.7) states that

*All tikanga Māori are firmly embedded in mātauranga Māori, which might be seen as Māori philosophy as well as Māori knowledge. While mātauranga Māori might be carried in the*

*minds, tikanga Māori puts that knowledge into practice and adds the aspects of correctness and ritual support. People then see tikanga in action. They do it, feel it, understand it, accept it and feel empowered through the experience. Tikanga Māori might be described... as the practical face of Māori knowledge.*

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## Glossary

Ahi kā	Those who keep the home fires burning
Ana	Caves
Aotearoa	New Zealand, Land of the long white cloud
Atua	God, Protector
Awa	River
Hakari	Feast
Hapū	Sub-tribe, pregnant
Inanga	Whitebait
Iwi	Wider tribal group
Kai	Food
Kai moana	Food from the sea
Kainga	Home, house, place of living
Kaitiaki	Guardian
Kaitiakitanga	Guardianship, trusteeship, resource management
Kākahi	Freshwater mussel
Kanohi ki te kanohi	Face to face contact
Kaumātua/Koeke	Elder
Kaupapa	Purpose
Kaupapa Māori	A Māori approach
Kawa	Marae protocol pertaining to a particular iwi
Kōaro	Freshwater fish
Koha	Gift, donation
Koiwi	Bones
Kōmiti	Committee
Kōura	Freshwater crayfish
Māori	The indigenous people of Aotearoa
Mahinga kai	Food-gathering places where food is traditionally gathered
Mana	Prestige
Mana whenua	customary authority over lands
Manaaki	To offer support, sharing
Manaakitanga (manākitanga)	Hospitality
Māori	The indigenous people of Aotearoa
Marae	Ceremonial courtyard
Mātauranga Māori	Māori knowledge
Mauri	Life-force

A COLLECTION OF READINGS FROM GRADUATE STUDENT THESES

Moana	Sea
Ngā	The (plural)
Pakeke	Middle aged person
Papatūānuku	Mother Earth
Paru	Faeces/sewage
Pūrākau	Stories
Rāhui	place a temporary prohibition on an area or place
Rama	To fish with torches
Rangatiratanga	Sovereignty
Rangatahi	Youth
Rohe	District
Rūnanga	Iwi council
Tamariki	Children
Tangaroa	God of the Ocean
Tangata	People
Tangata whenua	People of the land, local people
Taonga	A highly prized object, treasure, property
Tapu	Scared
Tika	Right
Tikanga	Customs, the correct way of doing things, protocol
Tino Rangatiratanga	Political sovereignty, chieftainship, self-determination
Tūpuna	Ancestor
Wāhi tapu or wāhi tapu	Sacred place
Waiata	Songs
Waiora	Clean water
Whakapapa genealogy	family tree
Whānau	Family group, family, off-spring, to be-born,
Whanaungatanga	Relationships, kinships
Whenua	Earth, placenta

*Te Rangahau Taiao  
ki Awanuiārangi*

CHAPTER NINE:

TE OHU MO PAPATŪĀNUKU  
A COLLECTIVE RESPONSE FOR THE HEALTH OF THE PEOPLE  
AND THE ENVIRONMENT

*Chase, T-R. (2017).*



Ko Taupiri tōku maunga  
Ko Waikato tōku awa  
Ko Tainui tōku waka  
Ko Waikato tōku iwi  
Ko Ngāti Mahuta tōku hapū  
Ko Tūrangawaewae tōku marae  
Ko **TE REINGA CHASE** ahau

**Work:** Health Administrator

Te Tohu o te Ora o Ngāti Awa

**Title:** Te Ohu mo Papatūānuku

A collective response for the health of the people and the environment

Quals: Masters of Indigenous Studies (Hons), BA Iwi environmental management

Background: Raised under the leadership of the Kingitanga and the influence of the Ringatu faith has provided her with a unique Māori worldview. Te Reinga credits the aspirations of her ancestors as guidance in her daily life, the skills and knowledge from her parents and family equip her with the tools to serve others for the betterment of future generations.

## Abstract

Exposure of multiple chemicals and other hazardous substances in New Zealand has been widely debated within the timber workforce. Since the introduction of *Pinus radiata* to New Zealand in the 1850s, wood preservatives enabled the tree to become one of the country's top export products. The timber industry used numerous chemicals and other hazardous substances and for the men and women who worked at the Whakatāne sawmill, different ways of exposure occurred regularly. However, the health conditions of families of former sawmill workers at the Whakatāne sawmill are still not fully understood or researched. Therefore, this research aims to explore the impacts for sawmill workers and their families through dyadic interviews and focus groups. Examining the health conditions and living practices of these families the research will make connections between chemical exposure and the diagnosis of symptoms and treatment. Significantly this research may also support the review of the Accident Compensation Act 2001, Part 2-Section 30.

## Introduction

The coastal township of Whakatāne sits in the Eastern Bay of Plenty, New Zealand. Over 700 years ago the Mātaatua canoe made its landfall at Whakatāne, and from this canoe descend many of the tribes of the Whakatāne and Bay of Plenty districts (Department of Internal Affairs, Centennial Branch, 2016). The local tribes of Ngāti Awa and Ngāti Pūkeko became proficient business people who maintained strong influence in the district for trading goods and livestock.

With the development of the Whakatāne port in the 1800s trading between tangata whenua (local people), whalers and sealers steadily grew. Whakatāne became an important shipbuilding base along the eastern coastline and from 1916 to 1921, it was the fastest growing town in the country with the draining of the Rangitaiki plains for farming and the introduction of *Pinus radiata* throughout the central North Island (Meredith, 2015). Preceding the Second World War, the country changed. In the 1930s, the New Zealand depression hit causing mass unemployment. Forestry planting soon became relief work to support hard economic times and the Manpower Act directed young Māori men ineligible for the military and women to work in essential industries, often located in cities. This resulted in a rural-urban shift and by 1951, the number of Māori living in urban areas had doubled. Within a generation of the war ending, 68% of Māori lived in urban areas (Ministry for Culture and Heritage, 2014). A post war building boom put demand for pine in both the domestic and export markets and an influx of Māori from around the Eastern Bay of Plenty joined the workforce of labourers in Whakatāne.

## Background

### *Whakatāne Sawmill operations*

The Whakatāne paper mill opened in 1939 on the banks of the Whakatāne River. It was built by New Zealand Forest Products, a privately-owned company and New Zealand's biggest manufacturer of timber, board and packaging products. From 1949 to 1989 the Whakatāne Sawmill was in operation producing high quality timber that was sent all over the country or exported. The Whakatāne site used multiple chemicals and hazardous substances for production and maintenance of the mill. Of significance was the continuous exposure of multiple chemicals over the duration of the sawmill workers' professional lives. A cocktail of hazardous substances and chemicals used on and around the Whakatāne mill occurred daily. The systematic exposure



increased the risk for all mill workers, especially those working outside in the elements. Most timber workers handled multiple chemicals and worked with numerous hazardous substances such as the herbicide 2,4,5, T., boron, copper chrome arsenic (CCA), black liquor and the aromatic hydrocarbons; benzene, diesel, oil, kerosene.

A common chemical used throughout the sawmill was Pentachlorophenol (PCP); a wood preservative used on its own or as a formulation of chemicals. PCP is well studied and known to cause reproductive and developmental problems, immune deficiency and cause cancers. 'Long-term exposure to low levels such as those that occur in the workplace can cause damage to the liver, kidneys, blood, and nervous system. Studies in animals also suggest that the endocrine system and immune system can also be damaged following long-term exposure to low levels of pentachlorophenol. These effects get worse as the level of exposure increases.' (Agency for Toxic Substances and Disease Registry, 2016).

#### *Impacts of multiple chemical exposure*

Due to the manufacturing timber process dioxins and furans are produced as by-products. Dioxins are a family of colourless, odourless, organic compounds produced naturally or through fabricated processes such as manufacturing. This includes; incineration, and paper and pulp bleaching, exhaust emissions, burning municipal waste, household trash and fuels (Ministry for Primary Industry, 2016). The dioxin compound attracts to air, water and soil particles where it can build-up in the environment. In the right environment, dioxins can bio accumulate, potentially causing serious health issues in mammals.

The most toxic and studied group of dioxin and furan is the by-product of PCP chemically known as 2, 3, 7, 8-tetrachloro-p-dibenzo-dioxin and (2, 3, 7, 8 TCDD). In 2008, Massey University report on the Health Outcomes in former New Zealand timber workers exposed to PCP examined mortality rates, took a cross section on morbidity from random ex-sawmill workers and compared those findings with another study on the blood serum tests of SWAP members. The report concluded SWAP workers had three times higher levels of dioxin in their blood compared to other former timber workers (McLean, Eng, Walls, Dryson, Harawira, Cheng, Pearce, 2007).

Global studies also show that dioxins, furans and other hazardous substances may have adverse effects on the generations of people and animals. From the early 1960s to the late 1980s, Ivan Watkins Dow chemical plant in New Plymouth manufactured the herbicide 2, 4, 5, T (2, 4, 5-Trichlorophenoxyacetic acid).

The chemical was an effective agent in combating scrub, gorse and blackberry in New Zealand. The herbicide mixed with other chemicals formed Agent Orange used as an effective defoliant in dense jungles during the Vietnam War. The National Resource Council Committee for the U.S. National Research Council calculated that about 18 million gallons (about 69 million litres) of herbicide sprayed over about 3.6 million acres (about 1.5 million hectares) in Vietnam in that period. (National Center for Biotechnology Information, 2014). Vietnam stopped spraying the herbicide once they found a link to birth abnormalities in humans.

Back in New Zealand at the Ivan Watkins Dow chemical plant, those workers who were in direct contact with the chemical began experiencing similar symptoms for civilians and military personnel in contact with the herbicide in Vietnam. A cohort study of serum dioxins of people living near the plant found they were more likely to have significantly higher dioxin levels than other New Zealanders. The Ministry of Health noted there was a small chance the cohort may

have health issues including a small impact on cancer mortality rates.

In 2006, the New Zealand Government agreed to a package, to address the health issues.

#### *Impacts for exposed Whakatane sawmill workers*

Indeed, it was not until the closure of the Whakatāne sawmill in 1988 that former sawmill workers realised they were suffering as a cohort from the same illnesses due to multiple chemical exposure. Even with the Whakatāne sawmill providing protective clothing they thought was acceptable to minimise chemical coverage; 'Aprons, gloves and gumboots didn't stop the workers' clothing from being saturated and their limbs constantly exposed.' Many workers who were in direct contact with PCP developed rashes over their arms and their thighs (Mantel, 2011). Men who worked on the green chain experienced reoccurrence of skin allergies, eyes and nose and throat ailments.

Other pathways of exposure came by way of dioxins and furans released into the environment via mill water runoff, incineration of wood waste, mill waste and dumpsites in the Whakatāne area. For over thirty years, dumped barrels of the impurities were deposited over 36 allocated sites in the Whakatāne area. These sites are considered to have higher concentrations of hazardous substances than normal levels, who pose a threat to the community of Whakatāne. Of the 36 dumpsites, 26 sites were risk assessed with the decision 23 were 'of concern'. These included; Mātaatua Reserve and Whakatāne river estuary. Although popular areas for community events and recreational activities, local hapū no longer practice traditional food gathering nor can they hand down skills and knowledge to future generations.

*'There was three different types of tuna (eel) and lots of different fish we caught in the drains and the river, most have gone and I wouldn't eat anything living around here now. Our pipi beds are pirau (decayed). They're no good, make me sick' (Harawira, J. Personal communication, 2016).*

Statements taken from mill workers explained how foreman instructed truck drivers to dump drums of chemicals from the mill and bury them deep into pits then cover them over with soil and wood waste (Mantel, 2011). Families living near contaminated areas who consume quantities of fish from contaminated waters may be exposed. This has proven so for the Whakatāne community fishing from Kōpeopeo canal.

The Bay of Plenty Regional Council (BOPRC) has advised the public to take precautionary measures to avoid direct contact and exposure including the cease of fishing and consumption of eels due to high levels of PCP contamination. An exposed person would be between 25 to 559 times over a safe dioxin dose from a combination of catching and eating eel (Gallagher, 2006). The Kōpeopeo Bioremediation Project; a partnership between the Waimana Rivers Scheme Liaison Group, Te Rūnanga o Ngāti Awa, Sawmill Workers Against Poisons and the Ministry for the Environment; are working to safely remove, store and treat the sediment. This is done through bioremediation, the use of microbes to clean up contaminated soil or water (Bay of Plenty Regional Council Toi Moana, 2017).

#### *Support for exposed sawmill workers*

Sawmill Workers Against Poisons (SWAP) was established in 1996. The group represented former Whakatāne sawmill workers who were frustrated by the lack of recognition and support. SWAP's vision is the bringing together of Mātauranga Māori, Western Science, Medicine and People, To Determine the Diagnosis of Chemical Sensitivity- for the health and wellbeing of the Environment

and the People (Dioxinnz.com, 2016). Within the decade of SWAP's conception, a cohort study was commissioned to collect data from sawmill and paper mill workers at their annual medical examination. During that period, research was surfacing regarding pentachlorophenol risks in the environment. With sufficient data, the team focused on the use of PCP as the most used chemical of exposure.

In 2006, The Accident Compensation Corporation conducted an exposure assessment of twenty-three members of SWAP. A work history questionnaire and copies of blood tests provided for analysis from both the SWAP members and 23 'non-exposed' sawmill workers as a comparison group. Results verified previous studies showing that SWAP sawmill workers were three times more exposed to PCP than other exposed sawmill workers in New Zealand. The heaviest exposed workers were 'graders', these men inspected the timber before it was sent to the green chain for sorting and distribution. Graders were responsible for mixing the anti-sap solution several times a day by hand. They also cleaned the tanks from which toxic impurities settled at the bottom (Kohe, M. Personal communication. 2016).

Indeed, a study conducted by Lou M Gallagher for Environment Bay of Plenty Regional Council confirms workers at the Whakatāne sawmill had the highest exposure levels. Summary of the report concluded 'Whakatāne sawmill site remains a source of significant human health risk, most which is the result of dioxins left in soils and sediment from environmental release of PCP. It would not be safe to live anywhere on this site' (Gallagher, 2006).

In 2010, a special support service was established for former sawmill workers exposed to PCP and other toxic chemicals. All sawmill workers throughout New Zealand from the 1950s to 1980s can register. Those who worked for more than one year using PCP, in an area where PCP was, are eligible for public funding. If accepted, the sawmill worker is entitled to a free annual health check from their doctor. Education and facilitation to public service is also available to those exposed from PCP. The Bay of Plenty Facilitation Service is based in Whakatāne expanding its support as far as Gisborne to Taupō, across to Pūtāruru and Rotorua. All other areas are supported by Allen & Clarke policy and regulatory specialists directed by the Ministry of Health to administer the special support service.

### Purpose of the research

Due to the closure of the sawmill and forced redundancy for staff and workers a number of economic and social issues were created for the community and families. A poignant and enduring issue is long-term receipt for those on sickness or invalids benefit. Many sawmill workers and family members are periodically subjected to reassessments of the welfare system, leaving behind a trail of generational dependency (Akuhata & Harawira, 2012).

There are several family members living with exposed saw mill workers, who continue to exhibit illnesses that are associated to the ongoing exposure from dioxins, furans and other hazardous substances. To this day, there has been no recognition over the years provided to those families affected.

Therefore, the research reflects the perspectives and experiences of Māori families affected by multiple chemical exposure and aimed to: (1) determine the cause and effect of exposure to support the diagnosis and treatment for those families, (2) gather evidence of intergenerational exposure, (3) establish connection between exposure of the families and recreational activities or cultural practices from contaminated dumpsites of the Whakatāne sawmill.

## Methodology

The research project took place in the rohe of Ngāti Awa within the Whakatāne area of the Bay of Plenty, New Zealand. As determined by local kaumātua Kaupapa Māori methodology was utilised to ensure the integrity of the research was upheld. Kaupapa Māori research is a framework that observes and practices Māori culture, language and worldview. It involves the mentorship of kaumātua; is culturally relevant and appropriate; satisfies the rigor of research, and is undertaken by a Māori researcher, not a researcher that happens to be Māori (Smith, 2012).

The Ngāti Awa framework "Te Pou Mataaho" was also chosen to guide and enhance the research. Te Pou Mataaho "Ultimate wellbeing" directs and enhances all cultural and spiritual approaches for service delivery and embraces kaupapa Māori principles of research. Te Pou Mataaho consists of four pou with conception from Ngāti Awa kaumātua.

Firstly, Te Pou Tātaiwhakaheke ō-Hineahuone provides us with the knowledge of and connection between others and ourselves through our whakapapa (genealogy). Secondly, Te Pou ō-Hine-titama Tūrangawaewae is the place you call home, your connection through the whenua to your place of identity. Thirdly, Te Pou Ihorangi ō-Papatūānuku represents the spiritual and cultural beginnings of whānau originating from the spiritual creator known as Io Matuakore. Finally, Te Pou Aotūroa recognises the world and all the influences both negative and positive that contribute to our development. The four pillars guided a holistic approach to the research.

Qualitative research methods included dyadic interviews and focus groups. Dyadic interviews were utilised with pairs of participants who have an established relationship and share commonalities. This supported the exchange of intimate information, perspectives, and opinions. Focus groups facilitated discussion between participants of the sawmill community, and allowed for comparisons of information and perceptions. All discussions were based on a semi structured questionnaire consisting of ten key questions. Questions were focused on how participants may have been exposed to multiple chemicals and other hazardous substances, any ailments they suffer from and how these have affected their lives.

Eight dyadic interviews with family members of exposed sawmill workers were conducted with the exposed workers spouse/partner and their child or grandchild. Re-arrangement of participants for dyadic interviews were changed as some wives wanted their husbands to take part. Consequently, three dyadic interviews consisted of the mill worker and his wife.

All interviews took place in the family home or on site at the SWAP office. Based on guidance from Kaumātua interviews were conducted in the morning as due to their illnesses participants became tired and irritable in the early afternoon. Participants' ages varied from a 30-year-old granddaughter to an 81-year-old great grandfather.

A focus group consisting of six SWAP members and two members of the public were interviewed at SWAP office. The Bay of Plenty Facilitation Service team supported them. Both Māori and non-Māori SWAP members were involved to reflect the mill workforce. SWAP chose for the focus group to take place at the SWAP office as the members felt it was the most appropriate and relevant place to discuss the research questions. In the case of medical assistance on site care was made available from registered nurses. A well-respected local kaumātua was also present during the focus group discussion and available to assist participants if required.

The interviewer visited sites with the SWAP coordinator including the Whakatāne mill, Te Pūpūaruhe cemetery, Kōpeopeo canal and Marshalls Road. The interviewer also visited four other sites. The SWAP coordinator gave consent to take an image of Te Pūpūaruhe cemetery. All

dyadic interviews, the focus group and a contaminated site visits were video recorded. For those participants who declined recording by videotape, audiotaping occurred.

To ensure safe ethical processes four principles guided the research including; manaakitanga (hospitality/respect), whakawhānaungatanga (maintaining relationships), mana (respect) and tapu (sacred) Specific measures taken to ensure safety of the research participants included:

Support processes were put in place to deal with adverse consequences, physical or psychological if risks should occur.

A risk management plan was developed by Te Tohu o te Ora o Ngāti Awa Social and Health Services to estimate risk impacts and define responses to issues

Ngāti Awa kaumātua provided guidance and cultural support throughout the research project.

Informed consent was obtained from all participants after their rights as research participants were explained. In line with ethical considerations all information and data will be secured and archived for 5 years at the SWAP office, Te Tohu o te Ora o Ngāti Awa, Whakatāne. At conclusion of the study, a presentation of findings to all participants and interested parties at SWAP office. Sawmill Workers Against Poison will be presented with a copy of the thesis.

## Findings

In general, the research illustrates that there have been several negative impacts due to the exposure of multiple hazardous chemicals. However, although symptoms were common in families they were often oblivious to the causes of their ailments. This lack of awareness meant that they did not seek support. The reoccurring psychological distress from effects from unemployment, dysfunctional relationships, misdiagnosis and pressure of departmental criteria has been overwhelming for many. Psychological trauma was evident in responses for all participants. Wives have developed coping mechanisms to tolerate unstable moods and situations of their husbands, while some couples have separated several times. Concern in the rise of substance abuse and anti-social behaviour was also expressed. The most poignant of responses was resilience of the women through hardship. It was evident wives, daughters and granddaughters suffer from gynecological problems, depression, and bowel or thyroid issues. Those women who hold matriarchal status in their families' express optimism for future generations.

Specific responses to each of the ten questions are presented below.

*Q1. As an ex-employee of the Whakatāne sawmill and board mill, how do you think you were exposed to dioxins, furans and other hazardous substances? (Ex- sawmill workers)*

It was clear to see that the focus group was well versed in the research of exposure pathways of multiple chemicals, dioxins, furans and hazardous substances. Notably, three participants had extensive knowledge of mill processes and production, which at times overtook the discussion. Each participant in the focus group took turns talking about his own experience working in various positions. It seems most of the men interviewed spent time working in other departments of the mill, exposing themselves in different ways. Five sawmill workers had direct contact with PCP working on the 'Green chain', they were also exposed regularly by other mill processes and the elements.

The conversation of exposure extended further afield concerning surface saturation entering the homes of sawmill workers when the mill site flooded. The men expressed their anger and frustration over the lack of direction from mill management. They feel health and safety policies weren't stringent enough. At the time, they all thought the tank driver who transported the PCP, covered from head to toe in a suit and mask was an overkill. On reflection, the men commented it was obvious the man knew more about PCP exposure. The mill bosses weren't telling the whole truth and they weren't going to do anything about it either. The men reminisced on the good old days, work hard - play hard culture that brought together a tight knit community. Their last thoughts before the interview closed focused on the loss of their work colleagues that died 'before their time' and their conviction caring for their families, the community and those still to come.

*Q2. How did you find out the connection between health issues and contaminated sites or chemical exposure?*

The overall feeling families expressed was the lack of awareness when their grandfathers, fathers, husbands and other relatives initially showed symptoms of exposure. The recurring symptoms of mood swings, anger and profuse sweating are common in whānau but the connection was never made until years later. Even then, not all mill workers were willing to talk about their own health problem to their kin. After the closure of the mill, friends and families noticed similar symptoms. Connection between the same cancers and illnesses to multiple chemicals and other hazardous substances was made clear once SWAP initiated awareness in the public eye. Fathers came home with information about PCP poisoning and news clippings from near and far. Some individuals had begun their own journey of research to help them understand what they were going through and how to cope. The media has played a huge part informing the public of the ongoing effects of toxic chemicals. The local newspaper and radio stations have been major contributors, informing and providing up to date information. Documentaries 'The Curse of PCP' and 'The Green Chain' run regularly on national television.

There are hapū members educated in the effects of PCP who have taken every opportunity to inform extended family and others willing to listen. It is noticeable at hapū gatherings during formal speeches at funerals of ex saw mill workers. Hapū have either restricted harvesting local food or prohibited the practice of specific ones. To this day, local hapū no longer harvest oysters, pipis or other fishes that cohabit in the Whakatāne waterways because of what they have been told by their relatives. Alas, members of the public can still be seen using contaminated sites to access food (Whakatāne Beacon NZ, 2016).

*Q3. Can you explain how you and your family were exposed to chemicals or anything else like contaminated sites?*

It is evident there was many ways in which families were exposed. Work clothes were washed with the rest of the household clothing or the normal practice of fathers' bathing with their children, unintentionally exposed generations. Contiguous living for sawmill workers and their families down Marshall Road, now called Mill Road, were flooded every winter to the point where rainwater and mill runoff fully immersed the grounds. The water took days to subside. Back then, all children played outside for hours. Mill children built huts from contaminated sawdust piles, sunbathed on the lawns and ate from exposed fruit trees. The same activities happened at the Mātaatua reserve, where the dumping of contaminated waste covered residence homes in



the Wairaka area. Local children played 'war' and 'hide n seek' amongst the mud and mounds of sawdust. Children's legs were burnt playing in contaminated coal ash sites, dumped as landfill. For the homes in the western areas of Whakatāne, forest burn offs and the mill incinerator blew ash into their water tanks used for the home.

Recreational activities and traditional practices of local people in local waterways existed up until the 1990s. Collecting molluscs, crustaceans, fishes and vegetation for communal festivities, tangihanga or the household were regular events. The practice of spraying weed killer in maize remains, leaving chemical residue for those who harvest pūhā. One sawmill worker reminded his family that his mother used the Kōpeopeo canal for their everyday water source as did many other people between the 1940s - 1960s. Born in the 1950s era, his mother washed him in the canal and spent his childhood playing and fishing there.

More than four local marae are directly affected as they used contaminated wood waste as landfill on or nearby. Local hapū used their own methods of identifying degradation of the land and health of the people but need more help to monitor effectively (Harmsworth & Tipa, 2006). Marae development for them may be a difficult and expensive process with council restrictions on contaminated sites. The list of exposure pathways is substantial.

*Q4. How do you think the health issues of your 'mill worker' affected the families or the community, how so?*

Three distinct themes surfaced regarding the effects 'mill workers' had upon their families, themselves and others. Mood swings, anger and depression to wives resulted in families separating on several occasions. Coping mechanisms of partners or in-laws helped to relieve the stress by removing themselves and the children from volatile situations and ill-treatment. Answers pointed out existing psychological trauma. Prolonged periods of abuse, chronic pain, depression, lack of communication and anxiety has taken its toll (Pick, 2017). One gentleman was too scared to go to sleep in case he abused his care giver, is a constant reality for him. Children and grandchildren who understand what poisons do to the body doubted if they could ever have children or that their children would be 'damaged' in some way. It wasn't always favourable knowing what they know now

Dynamics changed dramatically for some families. One father was alienated by his son who then turned to substance abuse to deal with his problems (Sinha, 2008). The increase of substance use in the community was discussed at length. Partners also talked about intergenerational behaviour of grandchildren whose family names were all too frequently appearing in court news of the local newspaper.

The most prominent threat to the lives of all participants and future generations was quality of life. Sawmill workers and their wives experience similar symptoms. It is hard for them to come to grips that their health and environment is deteriorating.

There are already limitations of what sawmill workers are with their families but especially their grandchildren. One grandfather was upset he couldn't show his mokopuna how to fish or dive. The men discussed some a distortion transferring knowledge to future generations was unmistakable.

*Q5. During the years your 'mill worker' was employed at the mill, did you suffer from any illnesses and the years following?*

This question stirred up a lot of sensitive memories, many who were visually emotional describing what they and their children experience. On three occasions, the interview stopped to provide assistance. The interviews proceeded as they were willing to continue. The most profound affect amongst the wives of mill workers was their resilient attitude handling trauma in their lives. Be it personally experiencing unimaginable pain and suffering from long term undiagnosed illness. Not to mention an array of malfunctions and disease of the female reproductive system. As mentioned throughout the conversations, the kiwi culture - 'bear it, get on with it' attitude existed back then. There was no women's support services or women's refuge, it was all 'swept under the carpet' (Schooler, 1978).

Mothers, their children and grandchildren now suffer from intergenerational illnesses from dioxin exposure.

In the present day, wives of sawmill workers have become proud grandmothers. Although they speak of a bleak future for their descendants, there is a glimmer of hope that the truth will prevail to get the support they need. Their focus now is for their mokopuna (descendant) who are also suffering.

*Q6. Do your children, grandchildren or great grandchildren suffer from any illnesses?*

The most obvious pattern of illnesses in three generations of females are gynaecological problems, therefore multiple miscarriages, heavy menstrual bleeding and still born births. It seems to be that most miscarriages came in the early stages of a women's child bearing age. Although we can see that three generations of females have the same health issues, grandmothers stated these kinds of problems were not genetic. Further illnesses are respiratory and skin disorders for children, grandchildren and great grandchildren. Asthma, bronchitis and eczema runs rife through them. Of concern is the amount of health failures grandchildren have. A still born mokopuna with congenital birth defects known as amniotic banding was born with its intestines out of the body. Another with dandy walker syndrome caused by abnormal brain development and another child born with developmental dislocation of the hip.

It is interesting to note that all three grandchildren live in the same area of Whakatāne, residing metres away from each other. Raynaud's disease causes one grandchild to suffer from cold and numbness in areas of the body due to poor blood circulation. The list goes on: depression, anxiety, ear problems, anger and learning difficulties are becoming common place.

Interview notes analysis concluded five generations were effected by exposure pathways. Of the three families that disclosed this, all four generations have illnesses that may link to exposure from dioxins, furans and other hazardous substances. All three families are Ngāti Awa descendants, who married into other local hapū and continue to live in Whakatāne. The first two generations (grandparents and parents) were former sawmill workers. The fifth generation of sawmill workers' families are now at the age to reproduce. Only time will tell what will become of them and their children.

*Q7. Were there any barriers to addressing your health concerns with health specialists or other agencies?*

The men and women interviewed expressed a strong distaste of health professionals in the past. Some believed when they first got sick, senior doctors practiced out dated attitudes and beliefs making it harder to trust any professional. Doctors over twenty years ago, were ill equipped to diagnose symptoms of chemical exposure because there was no research to make a fully informed decision. Younger doctors respond better, they have more understanding about chemical poisoning.

In the week following the focus group interview, SWAP members revealed part of the reason they mistrust doctors was misdiagnosis led to taking medications that didn't fix the problem. Three men stopped taking their pills because of this reason. A majority of the families concentrated their responses on today's health barriers. In discussion following the interview they talked about financial pressures to pay medical bills and confined to their homes because of ill health. An overwhelming response was that all families who rely on the health system wanted to reverse the cycle of dependency.

*Q8. Was there any company or community support for families or sawmill workers back then and now?*

While this question was asked to all participants, only sawmill workers responded. Very few knew about their sickness in the beginning so did not seek any help. The only support for sawmill workers in the early days was Timber Unions delegate for Whakatāne mill - Robert Gillies. Mr Gillies planted the seed of awareness as did Gordan Jackman and Harry Lagocki. Another matter raised was the lack of information from other areas about ex-sawmill workers. Were they being supported in the same way the men were in Whakatāne?

The unwavering support of SWAP has been a 'beacon in the storm' for these ailing men and their families. The Bay of Plenty facilitation service, under the umbrella of Te Tohu o te Ora o Ngāti Awa and coordinated by Kereama Ākuhata is also a service the men hold in high regard. According to Kereama, the service has the potential to do so much more for ex-saw mill workers and their whānau. It can be challenging but the rewards are considerable. He sees development in the service, to fully engage with outreach client base (Ākuhata, K. personal communication). The focus group recognised their illness may bring with it the onset of dementia, all experience symptoms. One has been diagnosed with the disease. He found it difficult to remember historical events and was constantly distracted (Dyall, 2014).

*Q9. Do you think there are any social or economic implications to your health issues?*

The social implications had devastating consequences for workers and their families. Because of their anger issues, one participant lost his job fighting at work. The impact of unemployment is significant. Families struggled daily, trying to find income in other ways. There were those who found work but years down the track, illness got the better of them. The men talked about the failure to keep a job, to provide for their families. They were forced to seek assistance from the

social welfare system. That plagued the families. The enduring psychological effects are ever present.

The men feel that their illnesses were misdiagnosed and departmental criteria restricted them from receiving the correct benefits they were eligible for. Meeting weekly at SWAP, they worked together to find the proper information they needed, they were more successful as a collective. Most damaging was the humiliation from judgmental staff with the pressure of gaining employment or up-skilling. The constant changes over the years in social welfare together with the emotional trauma has taken its toll, some to the point where they have isolated themselves from the public and from their families.

Seeking alternative treatments and therapy for pain relief is very real for the participants. Some go as far as sourcing a cheaper natural substance that will help them manage daily life. Their preference is alternative medication, treatments and therapy such as mirimiri (massage), naturopathy and kinesiology (Morleya, Ecclestonb, & Williams, 1999). They did not want to take synthetic drugs that may react with the chemicals they already have in their bodies.

Long term benefit receipt is generational (Victoria University of Wellington, 2010). These men and their wives are role models to their families. Their children and grandchildren aspire to what they are and what they have achieved. Their susceptibility may make them prone to substance abuse and behavioural problems even more so for those marae communities living on contaminated dumpsites.

It is probable those who are intergenerational effected or exposed through other means have no idea they are. The worry is people could be misinformed or not informed at all. Many don't want to know until they are personally affected.

*Q10. Do you know anything about the Kōpeopeo canal bioremediation project?*

By the response of family members few knew about the contamination of the Kōpeopeo canal nor had they any idea of what bioremediation meant. Although they were informed that it had been in the local newspaper frequently in recent years, they couldn't recall reading about it. SWAP members held extensive knowledge on the subject.

Question one gave responses by an educated group of saw mill workers. They identified numerous sources and reasons of exposure from multiple chemicals and hazardous substances while employed at the Whakatāne saw mill. A common distaste for mill mismanagement and negligible practices was apparent.

## Discussion

Saw mill workers identified several pathways of exposure from dioxins, furans and other hazardous substances while employed at the Whakatāne saw mill. The men worked in different positions in the Whakatāne sawmill and paper mill. They also helped other men with their jobs that involved chemicals. Not only were they exposed at work but also in their personal lives.

Wives and their children recognised ways of exposure causing them to suffer from debilitating illnesses. They have identified exposure to dioxins from their normal household routines, cultural practices, recreational activities and contaminated areas. The pattern of acute and long-term

illnesses aligns to the recognised illnesses of those who suffer from dioxin exposure. Congenital disorders in the same neighbourhood may need to be investigated further.

These illnesses may link to multiple chemical other hazardous substances considering families were exposed regularly through different pathways. Sawmill workers and their families are psychologically affected by symptoms of exposure from dioxin, furans and other hazardous substances. A combination of physical, social and economic stresses over the years remain constant in their day to day lives. Parents are anxious knowing their children are predisposed to addiction or may present with delayed behavioural problems.

Intergenerational exposure is evident in specific illnesses of families. Women's medical conditions, endocrine glands disease and mental health issues are common in families interviewed. Their offspring are diagnosed with respiratory illness, ear and skin ailments are widespread. Most concerning is the amount of birth defects in the same neighbourhood, amongst the same relatives. Five generations currently exhibit symptoms of dioxin exposure. Other children may not yet be diagnosed.

The saw mill workers and their families believe their illnesses have been misdiagnosed by professionals. The outcome of misdiagnoses ensued administering incorrect medication and an inaccurate evaluation for financial assistance. The generational long-term welfare dependency that has occurred because of exposure is also troubling for families. Those who are dependent on social welfare would prefer to be productive and contributing individuals to society.

Local Māori used their ancestral lands and waterways for decades before they were informed their land was contaminated wood waste sites. Local hapū placed restrictions on their traditional harvesting practices as a precaution. A handful of contaminated sites are known to most families as they have genealogy links to the area. Typically, members of the public ignore the warnings signs of contaminated sites and families possess little knowledge about contaminated sites. Those few who have interest in the topic are updated by media, relatives or informed by members of SWAP.

Former sawmill workers and their families are aiming for renewal and extended health coverage as well as full recognition of multiple chemical exposure. SWAP plays a critical role in supporting saw mill workers nationwide in which they continue to campaign for the recognition and support for families exposed to dioxins. Members are aging who are concerned their families' health needs will not be addressed. Although the cohort is well known nationally the younger family members are ignorant of SWAP and the special support service.

For the Whakatāne saw mill workers, SWAP and the Bay of Plenty Facilitation service have no distinction as they share the same vision of a collective response healing the health of the people and health of Papatūānuku. The Bay of Plenty Facilitation service runs a weekly programme for saw mill workers who are eligible for support. The number that attend is minimal considering the number of registered members in the area. Family attend on the odd occasion. The support service has limited functions to expand and extend delivery further afield. Prejudice exists for the SWAP men who were prejudged by health professionals due to mistreatment or misdiagnosis. Social isolation remains a concern especially in the outreach areas for the Bay of Plenty Facilitation Service.

## Recommendations

Results were discussed at consultations with participants and SWAP team. The following are the recommendations arising from this study:

1. All ex-sawmill workers continue receiving full, free, annual checks with specific attention to exposure to dioxins, furans other hazardous substances. Data from the health checks should be used for monitoring and analytic purposes.
2. All whānau and descendants of ex-saw mill workers be given full, free, annual checks with specific attention to exposure to dioxins, furans and other hazardous substances. Data from the health checks should be used for monitoring and analytic purposes.
3. Medical prescriptions should be free for whānau and descendants of ex-saw mill workers.
4. Specialist care should be provided by the health authorities at no cost for families and descendants of ex-saw mill workers, including transport costs, specialist referred tests and examinations.
5. Integrated systems of health care and any new health developments should be made freely available to whānau and descendants of ex-saw mill workers.
6. Alternative medicines, therapies and treatments including culturally based Māori rongoa should be made available to ex-saw mill workers, their whānau and descendants at no cost.
7. A learning component / case study be implemented into the curriculum for student doctors and student nurses about the effects of dioxins, furans and other hazardous substances on human life and the environment.
8. Education is required for whānau and descendants of ex-saw mill workers concerning effects of dioxins, furans and other hazardous substances, contaminated sites and bioremediation.
9. To establish a community based programme in Whakatāne including Iwi affiliates that will educate, build local knowledge and skills for future generations. The focus should centre on the effects of multiple chemicals and hazardous substances poisoning, contaminated sites and bioremediation.
10. The Bay of Plenty Facilitation service establish regular 'satellite' outreach programmes in Rotorua and Tokoroa.

## Conclusion

The community of Whakatāne is not as clean and green as it looks. Beneath the surface lies a legacy of poisoning. Recently a collective response for the health of the people and the health of Papatūānuku has begun. Still there are those like the wives and descendants of ex-saw mill workers who suffer from the same poisoning, there has been no recognition or support for them. SWAP and the Bay of Plenty Facilitation service remain the stronghold for ex-saw mill workers in Whakatāne, like their wives they want acknowledgement from exposure of dioxin, furans and other hazardous substances.



Their descendants know very little of their own plight. Along with their peers, they are our future. In the words of an ex-saw mill worker, 'We need to focus on healing the people and healing Papatūānuku. We need to make sure that this doesn't happen again' (Harawira, J, personal communication). Only time will tell what lessons we have learnt and decisions made where the hope is to live harmoniously together as children of Papatūānuku.

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