

What is MTM?

Manaaki Taha Moana (MTM) is a research programme to restore and enhance coastal ecosystems and their services of importance to iwi/hapu, through a better knowledge of these ecosystems and the degradation processes that affect them.

We utilise Western Science and Mātauranga Maori knowledge and participatory modelling tools and processes to assist iwi/hapu to evaluate and define preferred options for enhancing/restoring coastal ecosystems. This evaluation of options is assisted by innovative IT and decision support tools (e.g. digital libraries, simulation modelling, interactive mapping, 3D depiction, real-time monitoring).

Action plans are being produced for improving coastal ecosystems in each rohe.

The research team works closely with iwi/hapu in the case study regions to develop tools and approaches to facilitate the uptake of this knowledge and its practical implementation.

Mechanisms will also be put in place to facilitate uptake amongst other iwi throughout NZ.



Research Providers:

School of People Environment and Planning,
Massey University

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MANAAKI TAHA MOANA: ENHANCING COASTAL ECOSYSTEMS FOR IWI

MTM Report No. 23

Faecal Contamination of Shellfish on the Horowhenua Coast



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Background

Bivalve shellfish such as toheroa, tuatua, and pipi are important kaimoana species for Māori. The depletion (quantity) and degradation (in quality) of kaimoana resources is of immense concern to iwi. Degradation can be caused by toxins (e.g. heavy metals) and / or biological (e.g. faecal bacteria) contamination, either of which can make kaimoana unfit for human consumption.

Faecal contamination of kaimoana is of concern to Māori both as a health issue — because of the presence of pathogens — and because contact of faecal material with food sources is offensive. Sources of faecal contamination in the coastal marine environment include human sewerage / wastewater infrastructure, farmed animals, and wild animals such as possums and birds. Faecal contamination of coastal waters is higher after rainfall when effluent deposited on the land during dry periods, is washed into rivers and sea. Ministry of Health guidelines define levels at which bacteria are detectable but acceptable in terms of health risk. The inability to provide manuhiroa with healthy locally-sourced food is an erosion of mana. But even if health risks are minimal, contamination of mahinga kai with faecal material is, in itself, offensive to Māori. It may be that any detectable level of faecal indicator bacteria is therefore considered unacceptable.

The Horowhenua coast historically held abundant populations of toheroa (Redfean 1974; Moore & Royal 2012). These are now rare or absent along most of this coast. The dominant shellfish on the intertidal beach between Hōkio in the north and Ōtaki in the south are tuatua / pipi. While not as highly valued as toheroa, tuatua / pipi are nonetheless a taonga species and are widely and regularly collected for food along the Horowhenua coast (Moore & Royal 2013).

Revered in recent memory by kaumātua as an abundant food resource, the Waiwiri coastal foreshore adjacent to the mouth of the Waiwiri Stream, once provided local hapū and kaitiaki with a plentiful supply of shellfish, including toheroa. Anecdotal evidence suggests that the stream has suffered severe ecological degradation in the past 35 years, particularly the last decade. There is concern about the cumulative effects of loss of riparian vegetation, sedimentation, and increased nutrient and faecal loading in the Lake Waiwiri (Papaitonga) catchment to sea (Allen et.al 2012, Smith et.al. 2014).

In a previous study (Allen et al. 2012), *E. coli* concentrations from shellfish harvested near the Waiwiri river mouth, approximately 3 km south of Hōkio, were more than three times (and up to ten times) over the limit recommended for human consumption (230 MPN/100g NZ MoH 1995). These shellfish had been collected after moderate to heavy rainfall, and there remained some uncertainty about contamination levels under conditions of lower rainfall. Moreover, it was not clear how well the results at Waiwiri reflected contamination at other sites along the coast.

Methods

Tuatua / pipi were sampled for FIB on three occasions: following a long summer dry period (5&6 April 2014), after moderate rainfall (6&7 May 2014), and after light rainfall (22 May 2014). Only five

sites were sampled on the first two sampling occasions, but unexpectedly high faecal contamination was found, this motivated the decision to test all thirteen study sites on the final sampling date. The 13 sites selected for the faecal indicator bacteria (FIB) *Escherichia coli* sampling were the same ones used in the larger study that analysed of land cover and a shellfish (Newcombe et al. 2014).

Approximately twenty tuatua / pipi were collected per site on each sampling occasion. The shellfish were collected from the low intertidal or shallow subtidal zone and placed on ice for transport back to the Cawthron Institute, where they were processed according to the MPI Method Version 9, February 2013.

Results

Shellfish on the Horowhenua coast from Hōkio to Ōtaki had concentrations of *Escherichia coli* bacteria indicative of **widespread faecal contamination**. There was a **high level of contamination** at many sites, even under conditions of only minor local rainfall, and contamination was apparent even after a dry period. Thus our results suggest that, even after periods of no local rainfall, shellfish cannot be reliably considered to be uncontaminated at any of the 13 sites we tested.

Site #	Location	No recent rainfall (early April)	After minor rainfall (late May)	After moderate rainfall (early May)
11	South of Hōkio	230	700	5400
2	North of Waiwiri	140	1100	490
3	South of Waiwiri	330	310	1300
6	North of Ohau		1400	
5	South of Ohau		1300	
4	North of Walkawa		330	
7	South of Walkawa		790	
8	North of Waiorongomai	<20	50	790
9	South of Waiorongomai	130	130	490
10	North of Waitohu		170	
1	South of Waitohu		490	
120	Between Ōtaki surf club and Waitohu		490	
12	Ōtaki surf club		330	

Table 1—*E. coli* bacteria concentrations found in tuatua/pipi collected from beachers on the Horowhenua coast.

Shaded cells indicate values above tNZ Ministry of Health recommendations as marginally acceptable (orange) or unacceptable (red) for human consumption (faecal coliform counts, MOH 1995). Green indicates no *E. coli* were detectable with the methods used. Italicised values indicate the maximum value of a given category (acceptable/marginally unacceptable). Blank cells indicate that no shellfish were collected on that date.

Conclusions and Recommendations

Faecal contamination of tuatua / pipi on beaches from Hōkio to Ōtaki was worse than expected, and high even after dry periods or very light local rainfall. This represents both a human health risk and a degradation of mana to tangata whenua.

Analysis of shellfish flesh seems to indicate higher risk from contaminated shellfish than suggested by monitoring of coastal water quality. Improved stock exclusion and riparian management of freshwater are key to avoiding contamination of coastal kaimoana with faecal material.

Microbial source tracking could be used to identify the type of faecal material contaminating shellfish along the coast. Modelling of near shore hydrodynamics would assist in the understanding of the relative importance and spatial influence of different rivers and streams to contamination of the coastal environment.

Acknowledgements:

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Moko Morris of Ōtaki was “thrilled to have my children involved in this local hapū initiative, whose vision is to secure better outcomes for all who enjoy the moana. We learnt and laughed alongside all those contributing to the future health of Tangaroa. It was an honour to be engaged in active kaitiakitanga and to strengthen whanaungatanga amongst us.”

Keremihana Heke, customary kaitiaki for Ngāti Tukorehe and Deputy Principal for Whakaturanga Rua Mano Kura Kaupapa, Ōtaki, was a key participant in the shellfish survey with his whanau. “Having our tamariki involved and exposing them to the stories of their pakeke about the numbers of shellfish gathered in past years, was invaluable. I was reminded of how important it is for my own mokopuna that we continue to work with our environment for the betterment of the resource for future generations. Nā Rangi tāua, nā Tuānuku tāua — We are all descendants of the Sky and the Earth.”

Samples were processed at Cawthron by Ron Fyfe and his team at Cawthron Analytical Services.

