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

Taiao Raukawa Trust

Manaaki Te Awanui Trust

Waka Digital Ltd

Cawthron Institute

DOWNLOAD full copies of our FREE publications and other toolsets produced in this MBIE-funded research programme from our website:

www.mtm.ac.nz

Manaaki Taha Moana: Enhancing Coastal Ecosystems for Iwi

MTM Report No. 13

Ecological Survey of Tauranga Harbour

Manaaki
Taha Moana

RECOMMENDED CITATION: Ellis J, Clark D, Hewitt J, Taiapa C, Sinner J, Patterson M, Hardy D, Park S, Gardner B, Morrison A, Cullilford D, Battershill C, Hancock N, Hale L, Asher R, Gower F, Brown E, McCallion A 2013. Ecological Survey of Tauranga Harbour. Prepared for Manaaki Taha Moana, Manaaki Taha Moana Research Report No. 13. Cawthron Report No. 2321. 56 p. plus appendices.

Ecological survey of Tauranga Harbour

Coastal and estuarine environments are subject to multiple sources of anthropogenic (human-caused) stress, including increasing population pressure, urbanisation of the coastal zone and nutrient/ sediment runoff from agriculture and forestry.

In order to effectively manage these multiple stressors, managers need to be able to monitor and assess ecosystem health.

We identified key stressors within Tauranga Harbour, developed an approach to allow the monitoring of changes in ecological health over time and determined how key animals respond to increasing stressors.

Stressors on Tauranga Harbour

A survey of the health of Tauranga Harbour was undertaken to more fully understand the role of various anthropogenic stressors on the ecology of the harbour. During the December 2011 to February 2012 survey, MTM researchers and volunteers collected sediment and infauna (animals living within the sediment) from 75 sites across the harbour. Sediments, nutrients and heavy metals were identified as key anthropogenic stressors affecting the health of marine biological communities.

Sediments: Sediments within Tauranga Harbour were predominantly sandy, with the percentage of mud within a similar range as measured for other

New Zealand estuaries. The exceptions included Te Puna and Apata Estuaries, which experience higher rates of sedimentation.

Nutrients: Comparison of sediment nutrient concentrations with other New Zealand estuaries indicates that Tauranga Harbour sits within a range typical for slightly to moderately enriched estuaries. Te Puna Estuary showed relatively high nitrogen and phosphorous loadings compared to the other sites in the harbour.

Heavy metals: Heavy metal concentrations were well below guideline thresholds for possible biological effects and lower than concentrations measured in many other estuaries in New Zealand and overseas. Te Puna Estuary was found to have the highest levels of metals.

Sediments, nutrients and heavy metal concentrations all declined with distance from the inner harbour areas and associated rivers. This reflected the tendency of sediments, nutrients and contaminants to accumulate in depositional areas close to their source.

Assessing the health of the harbour

In the past, univariate metrics (*e.g.* indicator species, indicator ratios, diversity or contaminant metrics) have been used to monitor ecosystem health. These methods are not very sensitive and often only detect change between the most and least disturbed sites.

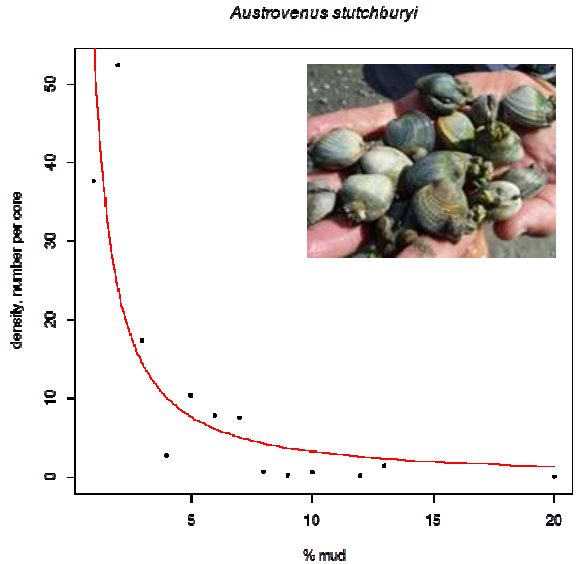
Multivariate methods utilize all of the biological information collected during a survey (number and type of animals and their relative abundances) and are therefore expected to be more sensitive to changing health. We used multivariate ordination methods to rank the health of intertidal sites in Tauranga Harbour based on predicted responses to key stressors .

The changes in biological communities generally reflected the gradients of stress very well and the models for sediments and contaminants (heavy metals) performed best. Sites identified as most impacted were generally located in the upper reaches of estuaries away from the influence of wind, waves and currents. As expected, our models were found to be more sensitive to changing environmental health than simple univariate measures.

The approach should enable long term degradative change from multiple disturbances to be assessed. It can be used as a management tool to determine whether the biological communities are moving toward a more healthy or unhealthy state.

Response of key species to stressors

We identified which animals are tolerant of stressors (*i.e.* present at impacted sites) and which are sensitive (*i.e.* only found at healthy sites). We then developed density-dependent models to work out how these species respond to stress. Beyond critical levels, shellfish were negatively affected by increasing sediments, nutrients and metals, while the response of polychaetes (marine worms) varied by species.



Species response curve for cockles - as sedimentation increases the number of cockles declines