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

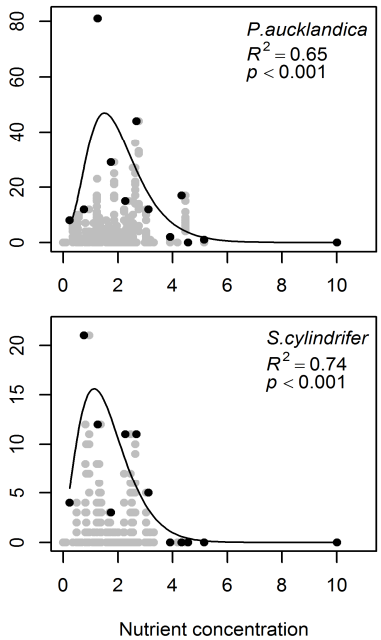
DOWNLOAD full copies of our FREE publications and other toolsets produced in this MBIE-funded research programme from our website:

www.mtm.ac.nz

MANAAKI TAHA MOANA: ENHANCING COASTAL ECOSYSTEMS FOR IWI

MTM work in progress

Species Distribution Models along Sediment, Nutrient and Contaminant Gradients



RECOMMENDED CITATION: Ellis JI, Clark D, Taipa C, Sinner J, Patterson M, Hewitt J 2015. Species distribution models along sediment, nutrient and contaminant gradients. Cawthron report (in review)

Species distribution models along sediment, nutrient and contaminant gradients

Elevated sediment, nutrient and contaminant loading to estuarine and coastal environments can occur via urban development, forestry, farming and inadequate land management practices. These stressors can cause broad-scale changes in estuarine and coastal ecology through modifying habitats and influencing the health, abundance and distribution of functionally important species. The rate of sedimentation and, therefore, habitat change in coastal ecosystems is likely to increase as a consequence of global warming. Likewise, coastal development and intensification are predicted to increase nutrient and contaminant loading to these systems. Hence there is a growing need to be able to predict ecological responses to such change in order to sustainably manage marine resources.

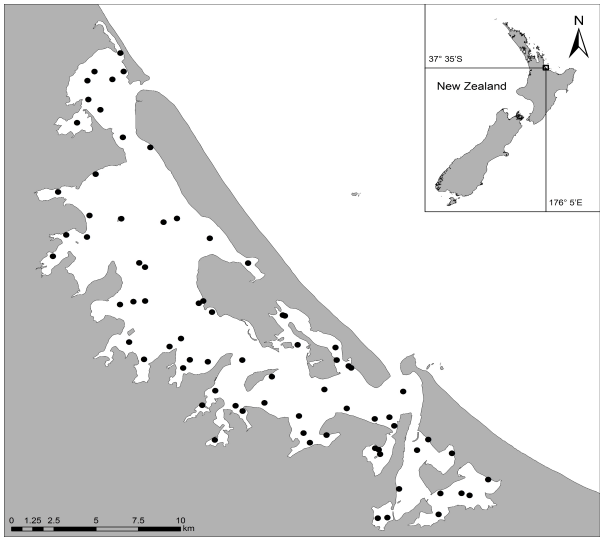


Figure 1. Map of Tauranga Harbour showing locations of the 75 sampling sites.

Synergistic effects are likely to occur as multiple stressors impact coastal ecosystems (Schindler, Crain et al. 2008) and these interactions are predicted to increase as climate change influences the delivery of freshwater sediments, nutrients and contaminents to the coastal zone. Therefore, understanding the response of macrofauna to sedimentation, as well as nutrients and contaminants, will be increasingly important under climate change scenarios.

Sampling was carried out in Tauranga Harbour from December 2011 to February 2012. A total of 75 sites across the harbour were sampled for benthic macrofauna and associated sediment characteristics. Sites were chosen to reflect a range of habitats, including intertidal sand flats, shellfish beds, seagrass meadows and areas likely to be impacted by pesticides. At each site, a 2 x 5 grid of ten plots (each 10 m x 10 m) was marked out and a replicate collected from each plot, yielding 750 samples overall (Fig 1).

Nutrient levels were indicative of a slightly to moderately enriched estuary and heavy metal concentrations were below Australian and New Zealand Environment and Conservation Council (ANZECC 2000) Interim Sediment Quality Guidelines, which provide thresholds for possible biological effects (ISQG-Low: Cu 65, Pb 50, Zn 200 mg/kg). Sediments, nutrients and heavy metals were all higher in inner harbour areas compared with outer sites. Chlorophyll-α showed no clear pattern across the harbour and did not appear to be correlated with nutrient concentrations. More detailed information can be found in Ellis et al. (in review).

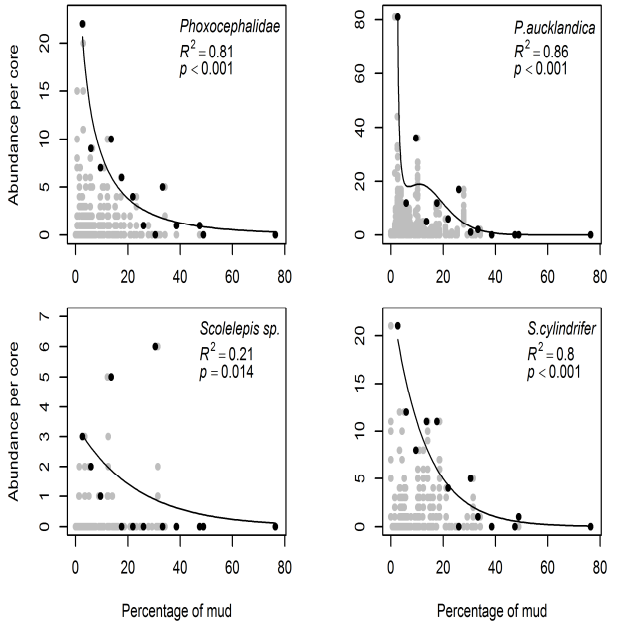


Figure 2 Relationship between individual taxa (as indicated) and percentage mud in the sediment

Species were either sensitive to sedimentation, nutrient loading or contaminants, or sensitive to these stressors beyond a critical point. The abundance of most taxa declined in response to sedimentation and contamination while a threshold response was often associated with nutrient loading. Unimodal responses, where maximum abundance occurred at relatively low percentages of mud content, were found for a crab (*H. whitei*) and three polychaete worms (*H. filiformis*, *S. benhami*, Nereididae). Increased sediment, either deposited on the seafloor or suspended in the water column, can negatively impact organisms (*i.e.* via burial, scour, inhibiting settlement, decreasing filter feeding efficiency, decreasing light penetration) and lead to reductions in diversity and abundance.