

# Coastal Case Study

## Estuary Monitoring Programme

Northland's estuaries are important economic, social and cultural assets, with harbour and estuarine systems such as the Whāngārei Harbour and the Bay of Islands contributing significantly to Northland's economy and the environment.

Estuaries are particularly valued because they are very productive ecosystems that play important roles in the functioning of coastal environments.

However, because estuaries and harbours are located at the end of the freshwater drainage system, they are vulnerable to land-based activities and processes that occur within their catchments. Sediments and chemicals often deposit in estuaries. As fresh water mixes with salt water, fine silts and clays form lumps - often with chemicals attached or absorbed - and settle out of the water column.

Despite their importance to people and the environment, many of Northland's estuaries have been modified and impacted by human activities. Extensive vegetation clearance for agriculture and urban development has increased the amount of sediment, nutrient and metal contaminant loads that reach estuarine environments. In addition, significant areas of saltmarsh and mangrove forest, which can act as natural filters, have been drained for agriculture, urban development and infrastructure projects.

The Northland Regional Council has implemented an estuarine monitoring programme in order to:

- Assess the health of our estuaries and monitor change over time;
- Identify impacts from diffuse inputs and cumulative impacts of contaminants from human activities and development;
- Assess the effectiveness of Northland's regional plans and rules and enable informed decision-making by politicians and resources managers; and
- Inform the public and promote awareness of environmental issues impacting estuarine health.

## What we monitor and where

In 2009-2010, the Regional Council monitored five estuaries with new sites added in Whangaroa Harbour and Kaipara Harbour. In total, four sites were monitored in the Whāngārei Harbour, three sites in the Kerikeri Inlet and two sites in Ruakaka Estuary, Kaipara Harbour and Whangaroa Harbour.

The Council's estuary monitoring programme uses methods described in the Estuary Monitoring Protocol, which was developed by Cawthron Institute for use by Regional Councils. This protocol ensures that the results collected by the Regional Council are scientifically credible and comparable to those collected throughout New Zealand.

A key element of the programme involves sampling the biological communities of representative intertidal habitats. In addition, the physical (sediment particle size) and chemical properties (nutrient and metal contaminants) of the sediment are monitored so that we can try to understand the factors that are influencing the biological communities at different sites.

## 2009-2010 results

### Biological communities

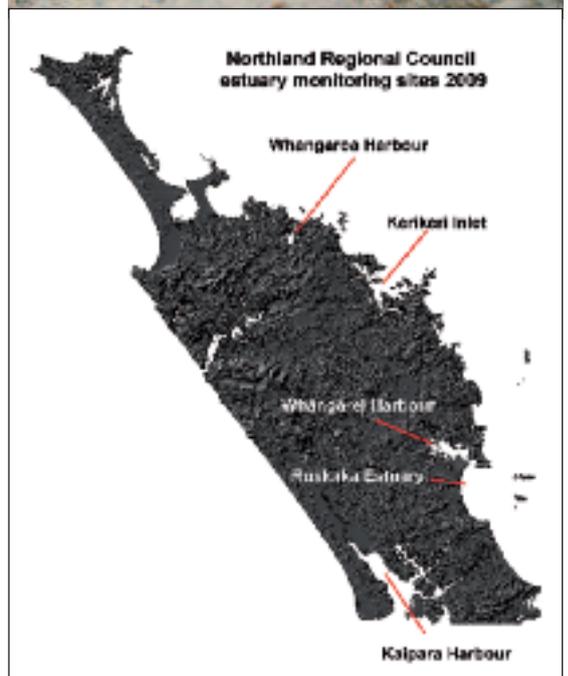
In the five estuaries monitored in 2009-2010, more than 22,000 individuals were identified belonging to 94 species. The biological communities at each monitoring site were found to be distinctly different from each other and there is some evidence that the biological communities in the sediments may have been influenced by human activities.

### Key points 2009-2010

- Five estuaries were monitored including Whāngārei Harbour, Kerikeri Inlet, Ruakaka Estuary, Whangaroa Harbour and Kaipara Harbour.
- The biological communities at each monitoring site were distinctly different from each other.
- Metal concentrations complied with the Australian and NZ Guidelines for Freshwater Quality ANZECC at all monitoring sites.
- High nutrient levels were recorded in Whāngārei Harbour and Kerikeri Inlet compared to other similar programmes in New Zealand.
- Further investigations will be undertaken to understand the factors influencing the biological communities.



Ruakaka Estuary.

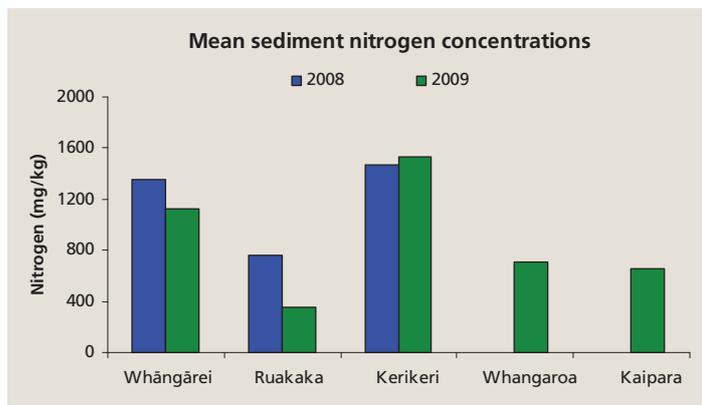


The abundance of species, that are known to be sensitive to human disturbance was generally lower at sites where concentrations of metals and nutrients were elevated. Conversely species that are tolerant to human disturbance were generally more abundant at sites with elevated levels of nutrient and metal contamination. Sediment particle size itself is known to influence biological communities and so further analysis is therefore being undertaken to understand how the sediment quality and sediment particle size is influencing the biological communities.

## Nutrients

There are currently no national guideline values for sediment nutrient concentrations in New Zealand. However, nutrient concentrations in the Whāngārei Harbour and Kerikeri Inlet were high in comparison to concentrations recorded in similar monitoring programmes elsewhere in New Zealand.

Concentrations of both phosphorus and nitrogen were high at sites in the Hātea River, Mangapai River, Waipapa River, Kerikeri River and Kahoe River, and at levels that suggest these environments are 'enriched'. Nutrient enrichment can lead to excessive plant growth, which can in turn cause a rapid reduction in water quality, harmful algal blooms, shellfish contamination, fish kills and a reduction in biodiversity. Nitrogen concentrations in Ruakaka and Whāngārei Harbour were lower than in 2008 but phosphorus concentrations in Whāngārei and Ruakaka had increased in comparison to 2008 levels.



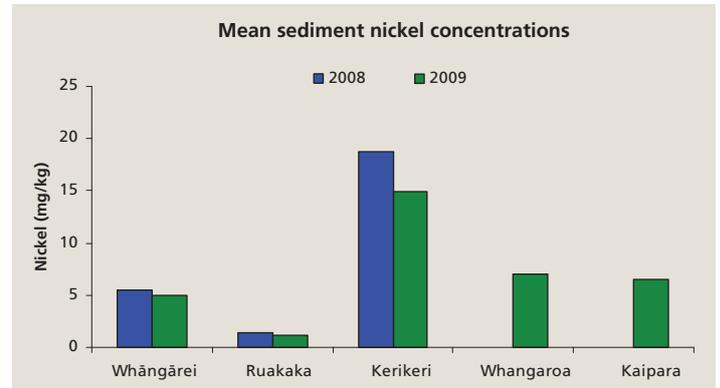
## Metals

In 2009, sediment metal concentrations complied with ANZECC guidelines at all of the monitoring sites. These metal concentrations have not changed markedly since 2008. Nickel concentrations have decreased in the three estuaries monitored in 2008 and 2009 (Whāngārei, Ruakaka and Kerikeri) and copper and zinc concentrations in Ruakaka Estuary sediments were lower than levels recorded in 2008.

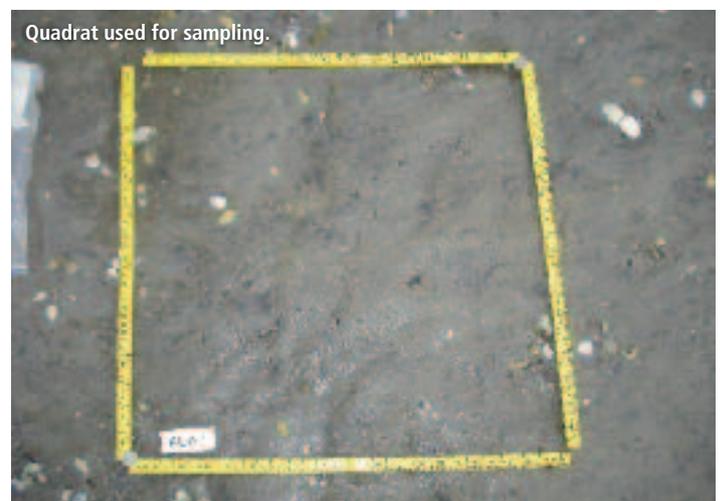
However, in the Hātea River, Whāngārei, relatively high concentrations of copper, zinc and lead were recorded and in the Kerikeri and Waipapa Rivers in the Kerikeri Inlet, concentrations of chromium, copper, nickel and zinc were also relatively high, compared to levels reported in similar monitoring programmes elsewhere in New Zealand.

The Hātea River is located in a highly modified urban catchment where metal concentrations are to be expected while the Kerikeri Inlet has a predominately rural catchment, with little urban or industrial land use, so levels are more unexpected. Runoff from roading, urban areas, agricultural

and horticultural land, and stormwater discharges are all likely sources of metal contamination in these systems. Further investigation is needed to identify the sources of metal contamination in Kerikeri Inlet and the Hātea River.



Copper is used in roofing, drain pipes, antifouling paint for ships hulls, fungicides, electrical wiring, electronics, wood preservatives, and agrichemicals, and these are all possible sources of copper found in estuaries. Zinc is used in galvanised roofs, drainpipes, house paints, marine anti-fouling paint, tyres and some agrichemicals such as fertilizers and pesticides. Chromium is used in electronic components, paints, as a wood preservative and as corrosion protection in zinc plated steel. Nickel is predominately used as an alloy in metals, including stainless steel and is also used in nickel-cadmium batteries, paints and computer components. Metals are also found naturally for example in volcanic soils, so soil erosion may therefore also contribute to metal concentrations in our harbours and estuaries.



## Future monitoring

- Review of the EMP data is being undertaken this year to assess changes in biological community trends over the last three years.
- The programme will also be assessed to determine the optimum number of sites needed in each estuary and the sampling frequency.
- Investigate historical sedimentation rates in our harbours to determine how land use changes have influenced sedimentation rates over time.