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## **Progress report on the investigation of chemical contaminants in shellfish**

### **1. Purpose**

To provide an update on a Greater Wellington Regional Council investigation into chemical contaminants in the marine environment of the Wellington Region, currently focussing on shellfish.

### **2. Background**

The Greater Wellington Regional Council has measured the levels of a range of chemical contaminants in the tissues of four species of shellfish found around the Region's coastline. The purpose of this research was to:

- assess the use of shellfish monitoring for measuring marine and estuarine water quality with respect to low-level contaminants that are not practical to measure routinely as part of an ambient water quality programme;
- provide a baseline for identifying spatial patterns of contamination, and measuring trends over time in contaminant levels, should a sentinel shellfish monitoring programme be established in the Region;
- contribute regional information on the movement of chemical contaminants into marine food chains; and
- assess the risks to human health resulting from the collection and consumption of feral shellfish from the Region.

The investigation links to the GWRC stormwater programme, in which the same suite of chemical contaminants is being analysed in the discharges from a variety of urban catchments.

### 3. Methods

The species of shellfish studied were black-foot paua (*Haliotis iris*), blue mussel (*Mytilus galloprovincialis*), cockle (*Austrovenus stutchburyi*), and tuatua (*Paphies subtriangulata*). The 21 study sites (Table 1) were selected to represent the major biogeographic and ecological divisions of the Region's coastline, as well as areas of the Region where traditional and recreational collection of shellfish for human consumption occurs regularly. Pollution sources were not specifically targeted, nor was a minimum distance from a known pollution source specified. Samples of black-foot paua were collected by diving; the remaining species were collected by hand from the lower intertidal (cockles) or immediate sub-tidal (blue mussels and tuatua). All analyses were conducted by Agriquality New Zealand Limited on homogenised composite samples. Whole shucked shellfish were used for analysis in all cases. The analytes were total lipid, six heavy metals (cadmium, chromium, copper, lead, mercury, and zinc), organochlorines (14 varieties), chlorophenols (18 varieties), polycyclic aromatic hydrocarbons (16 varieties), and polychlorinated biphenyls (40 varieties). The majority of these analytes are US EPA "Priority Pollutants".

**Table 1. Location of shellfish samples from the Wellington region used for the analysis of chemical contaminants, 2001/2002.**

Locality	Date collected	Grid reference		Species
		Easting	Northing	
Porirua Harbour at Te Hiko Street	20/03/2001	2664306	6007564	cockle
Porirua Harbour at Paremata Railway Station	20/03/2001	2666645	6009635	cockle
Porirua Harbour at Motukaraka Point	20/03/2001	2669325	6010746	cockle
Wellington Harbour at Point Howard	22/03/2001	2669600	5993020	blue mussel
Wellington Harbour at Sunshine Bay	22/03/2001	2669646	5991109	blue mussel
Wellington Harbour at Burdans Gate	22/03/2001	2667482	5986637	blue mussel
Wellington Harbour at Inconstant Point	22/03/2001	2664932	5982542	blue mussel
Wellington south coast at Hue-te-taka Peninsula	26/03/2001	2661470	5983320	blue mussel
Wellington Harbour at Mahanga Bay	26/03/2001	2663547	5989182	blue mussel
Wellington Harbour at Shark Bay	26/03/2001	2662176	5987920	blue mussel
Wellington Harbour at Ferry Terminal	26/03/2001	2660007	5992268	blue mussel
Wellington Harbour at Scorching Bay	6/04/2001	2663480	5988121	blue mussel
Wellington west coast at Green Point	19/02/2002	2661474	6008975	black-foot paua
Wellington west coast at Ohariu Bay	19/02/2002	2653909	5998020	black-foot paua
Wellington south coast at Island Bay	19/02/2002	2658929	5983010	black-foot paua
Wairarapa south coast at Cape Palliser	4/03/2002	2696850	5953303	black-foot paua
Wairarapa east coast at Flat Point	8/03/2002	2758655	5991411	black-foot paua
Wairarapa east coast at Mataikona	8/03/2002	2784826	6037721	black-foot paua
Raumati Beach at Kainui Road	20/03/2001	2676176	6027855	tuatua
Peka Peka Beach at Road End	13/03/2002	2683215	6039608	tuatua
Otaki Beach at Surf Club	13/03/2002	2688601	6050007	tuatua

### 4. Results

The detailed results of the investigation are not presented here. The heavy metals data has raised a number of issues related to sampling and interpretation which are being reviewed by an external consultant, while the organic contaminants data has yet to be examined in detail. However, the following general observations can be made.

## Heavy metals

The heavy metals tested were all present at measurable concentrations in the four species of shellfish examined.

- Each heavy metal showed relatively little spatial variation in concentration between samples of individual shellfish species.
- Some differences in heavy metal concentrations between shellfish species appear to be the result of factors unrelated to anthropogenic inputs.
- In the late summers of 2001 and 2002 none of the heavy metals were present in the shellfish tested at concentrations which exceeded the New Zealand Food Safety Authority guidelines for edible tissue, where such guidelines exist. This should not be interpreted as meaning other species of shellfish, or examples of the tested species taken from within the mixing zones of point sources, were also within the guidelines.

## Organochlorines

- Organochlorines were not detected in paua, but a number of these compounds were present at measurable concentrations in all the samples of cockles, mussels, and tuatua.
- In the late summers of 2001 and 2002 none of the organochlorines were present in the shellfish tested at concentrations which exceeded the New Zealand Food Safety Authority guidelines for edible tissue, where such guidelines exist. This should not be interpreted as meaning other species of shellfish, or examples of the tested species taken from within the mixing zones of point sources, were also within the guidelines.

## Chlorophenols

- Chlorophenols were not detected in paua, but compounds from this group were present at measurable concentrations in all the samples of cockles, mussels, and tuatua, with the range of compounds generally decreasing with distance from urban areas.
- There are no specified safe levels for chlorophenols in shellfish for human consumption.

## Polycyclic aromatic hydrocarbons (PAHs)

- Polycyclic aromatic hydrocarbons were only detected in some cockle and mussel samples, generally those close to urban areas.
- There are no specified safe levels for polycyclic aromatic hydrocarbons in shellfish for human consumption.

## Polychlorinated biphenyls (PCBs)

- A range of polychlorinated biphenyls were present at measurable concentrations in all the samples of cockles, mussels, and tuatua. PCBs were not detected in paua except for the sample at Island Bay. All but one of the PCBs in this paua sample were also detected in urban stormwater samples taken in Island Bay in August 2002.
- In the late summers of 2001 and 2002 total PCB concentrations in all the shellfish samples tested were below the US Food and Drug Administration guideline for PCBs in shellfish for human consumption. This should not be interpreted as meaning other species of shellfish, or examples of the tested species taken from within the mixing zones of point sources, were also within the guidelines.

## General

- The concentrations of organic compounds such as PAHs and PCBs in the shellfish tissues are considered to represent the balance between the uptake and elimination of these compounds by the shellfish over periods of up to several weeks. In contrast, the concentrations of metals in the shellfish tissues are considered to represent the balance between the uptake and elimination of metals by the shellfish over periods of months to years.

## 5. Conclusion

Shellfish in waters adjacent to the Region's urban areas in particular appear to be being exposed to anthropogenic sources of at least some of the contaminants measured. Preliminary results from the GWRC stormwater investigation suggest that urban stormwater is the most likely source of these contaminants.

The shellfish tests are just one contribution to a much needed broader assessment of the environmental effects of the Region's urban stormwater. This assessment should include studies of contaminant levels in other components of marine food chains such as crabs, fin-fish, and sediment-dwellers, as well as further surveys of contaminant concentrations in harbour sediments.

## 6. Communications

Analytical data from Wellington Harbour and south coast shellfish samples has been made available to Montgomery Watson Harza for use in a stormwater Baseline Assessment of Environmental Effects the company is currently preparing for the Wellington City Council. A technical report will be prepared once internal and contracted external assessment of the data has been completed.

**7. Recommendation:**

*It is recommended that the Committee:*

1. *receive the report; and*
2. *note the contents.*

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