

## Heavy metal contamination in the northern Spencer Gulf—a community summary

## The northern Spencer Gulf is an important environmental, social and economic region in South Australia.

Its vast seagrass meadows, saltmarshes and mangrove forests sustain a diverse aquatic ecosystem. It is a significant nursery and feeding area for a number of commercially important fish and shellfish, including King George whiting, southern sea garfish, snapper, southern calamari, blue swimmer crabs and king prawns.

The aquaculture of yellowtail kingfish is also expanding in the region and ecotourism continues to grow, particularly due to the annual spawning of the Australian giant cuttlefish near Whyalla.

The northern Spencer Gulf is also an important industrial area, accommodating industries such as the Zinifex lead-zinc smelter at Port Pirie (formerly known as Pasmenco) and the OneSteel steelworks at Whyalla.

While the industries in the region provide economic benefit to the state, they discharge significant amounts of heavy metals into the air, onto land and directly to the gulf waters.

Studies conducted over a number of decades have shown elevated levels of metals in the upper section of the gulf, particularly in Germein Bay near Port Pirie.

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Steelworks at Whyalla



Port Pirie smelter



## Factors affecting the water quality of the northern Spencer Gulf

**Industrial practices in the region continue to contribute considerable amounts of heavy metals to the northern Spencer Gulf, as detailed below:**

- > Historically, heavy metal pollution from the smelter at Port Pirie has entered the environment through emissions from smoke stacks, dust blown from the site, the spillage of concentrates during the loading of ships, and effluent discharged to the Pirie River and First Creek. Silt has been dredged from the Port Pirie harbour area and dumped in Germein Bay, also contributing to metal contamination of the gulf.
- > High quantities of arsenic, cadmium, lead, mercury, nickel, selenium and zinc continue to be discharged from the Port Pirie smelter.
- > Significant amounts of zinc are being discharged from the steelworks at Whyalla directly into gulf waters.
- > In comparison, other industries and utilities in the region discharge considerably smaller quantities of heavy metals into the local environment.

Several studies have been conducted over the past few decades in the northern Spencer Gulf by universities, SARDI and CSIRO. These studies have involved investigations of water and sediment quality, as well as studies of marine organisms, mostly around Port Pirie and Whyalla. They have shown that:

- > many organisms in the gulf store elevated quantities of heavy metals, particularly lead, zinc and cadmium, in their tissues

- > heavy metal pollution has affected the diversity of animal life in the region, with a reduction in the number of animals living in seagrass beds near the pollution sources
- > concentrations of some metals in razorfish collected from Germein Bay, near Port Pirie, were found to be above food standards; as a result, the collection of marine benthic molluscs is currently prohibited from most of Germein Bay.

## What did our study involve?

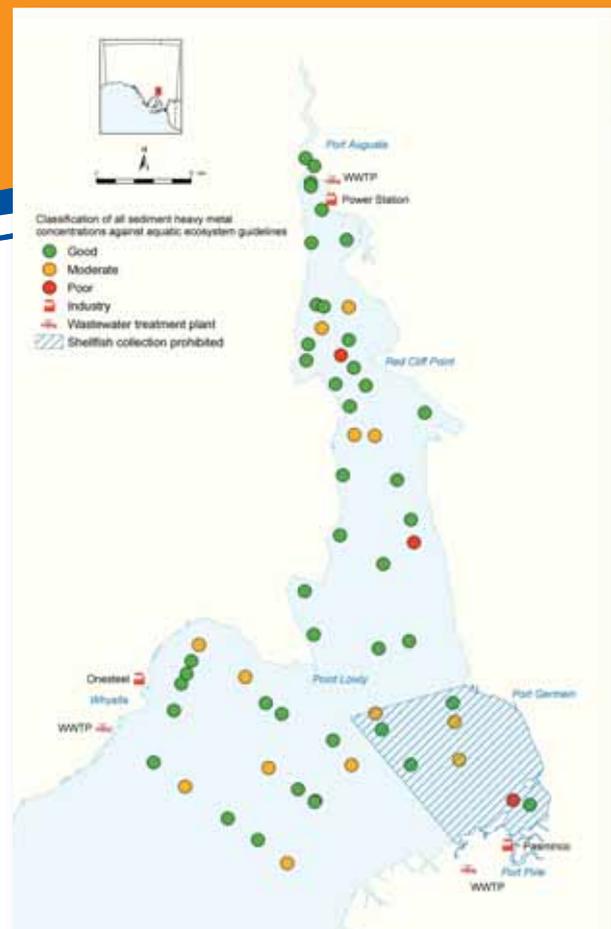
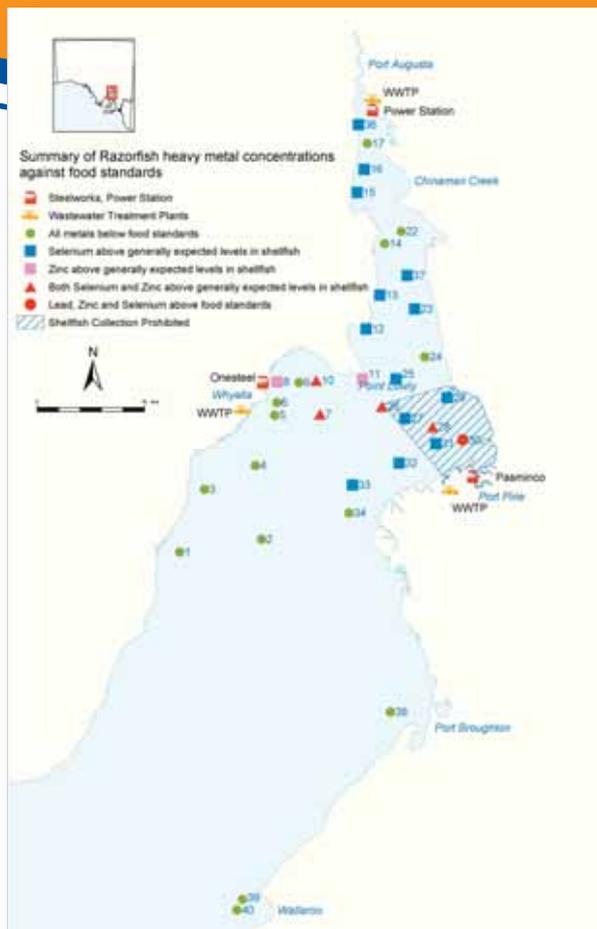
**In 2001, the Environment Protection Authority (EPA) examined the distribution of some heavy metals in the northern Spencer Gulf by measuring concentrations in marine sediments and razorfish.**

Razorfish are large fan-shaped marine molluscs that can be found embedded in the soft sediments of the gulf. They filter fine particles from the water to feed on and by doing this can inadvertently ingest heavy metals, which build up within their body tissues. Razorfish are usually collected to use as bait, although some people collect them to eat.

Razorfish were collected from several locations between Port Augusta and Wallaroo. The edible portion of the razorfish (the muscle) was analysed for arsenic, cadmium, copper, lead, mercury, selenium and zinc, and concentrations of these metals were assessed against food standards.

Sediment samples, collected by the Department of Geology at The University of Adelaide, were analysed for cadmium, chromium, copper, lead, nickel and zinc. Concentrations of these metals were classified as good, moderate or poor against national sediment guidelines.

This brochure provides a summary of the results from the EPA report 'Heavy metal concentrations in razorfish (*Pinna bicolor*) and sediments across northern Spencer Gulf', which can be viewed at [www.epa.sa.gov.au/pub\\_water.html#other](http://www.epa.sa.gov.au/pub_water.html#other)



## What did we find?

The results from our study can be summarised as follows:

- > Cadmium, mercury and copper concentrations in razorfish were below the food standards at all sites.
- > Concentrations of selenium and zinc were elevated in some razorfish collected within the prohibited zone near Port Pirie.
- > Lead was measured at concentrations above the maximum level allowed in molluscs at one of six sites investigated in the prohibited zone in Germein Bay, approximately 7 km from Port Pirie. This was the only site to have concentrations of lead exceeding the food standards, and was known to be close to an area where contaminated dredge spoil from the Pirie River had been dumped.
- > Elevated concentrations of zinc were also measured in razorfish from False Bay near Whyalla.
- > Concentrations of lead, selenium and zinc in razorfish were found to decrease as distance from the Port Pirie smelter increased. However, there was no obvious relationship between metal concentration and the distance from the steelworks at Whyalla.
- > Concentrations of metals in the sediment did not appear to be related to the distance from the Port Pirie smelter.
- > Concentrations of cadmium, lead and zinc in the gulf sediments were classified as poor against national guidelines at two sites in the northern Spencer Gulf (one approximately 5 km from Port Pirie and one near Red Cliff Point, approximately 56 km north of Port Pirie). The concentration of cadmium in sediment collected from a third site (approximately 34 km north of Port Pirie) was also classified as poor.
- > Moderately elevated concentrations of copper, chromium and nickel were measured in the sediments at one site.
- > Concentrations of metals in sediment at all other sites were classified as good.

## What is being done to help reduce pollution in the northern Spencer Gulf?

In recent years, several positive developments have occurred to reduce the amount of pollution entering the gulf:

- > Many industries are now required to estimate and report to the EPA on their emissions of selected pollutants as part of the National Pollutant Inventory (NPI) program. Further information is available from the EPA's NPI web page — [www.epa.sa.gov.au/npi.html](http://www.epa.sa.gov.au/npi.html)
- > Concentrations of metals being discharged from the smelter at Port Pirie into the marine environment have been considerably reduced in the last decade or so, particularly with the introduction of a new treatment system. Emissions of arsenic, cadmium, copper, lead and zinc into the water have reduced by between 80 and 85% since 1990, while selenium emissions into the water have been reduced by 90%. Although these reductions are significant, there are still large quantities of heavy metals being discharged into the environment.
- > The Port Pirie smelter is taking steps to reduce air emissions from their slag fumer, with the aim of reducing blood lead levels in infants in Port Pirie. An additional benefit of this process will be a reduction in the lead deposited in marine waters.
- > Environment improvement programs have been implemented for two wastewater treatment plants (WWTPs) in the region. The Port Pirie WWTP has recently undergone an upgrade to improve the quality of wastewater being discharged, and a recycling project is currently being developed at Whyalla WWTP to reduce the volume of wastewater discharged into the Spencer Gulf.
- > The introduction of the *Environment Protection (Water Quality) Policy 2003* has set clear standards for protecting the marine environment from pollution.

While improved industrial practices in the region have reduced heavy metal emissions, there are still large quantities being released to the gulf.

Historically, industrial practices in the northern Spencer Gulf have left the region with a substantial legacy of heavy metal pollution. However, these practices have been vastly improved in recent years and this has helped to reduce the amount of heavy metals entering the marine environment.

Slowing or reversing the effects of historical practices in the region will take many years but, with continued improvements, the natural and commercial value of the Spencer Gulf can be preserved and protected.

**The Environment Protection Authority will continue to monitor the northern Spencer Gulf.**



Razorfish (*Pinna bicolor*)

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