ENVIRONMENT PROTECTION AUTHORITY

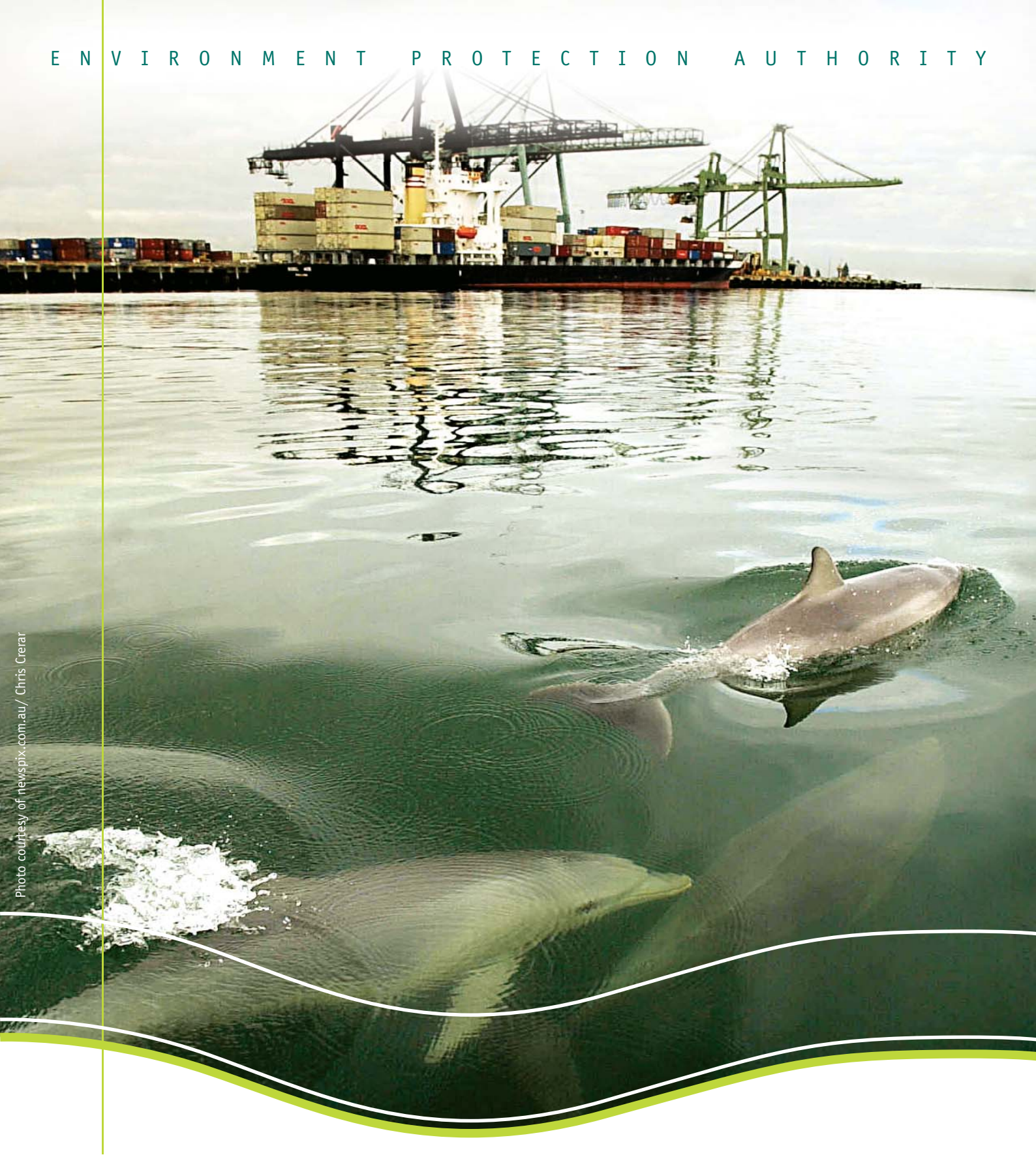


Photo courtesy of newspix.com.au/ Chris Crerar

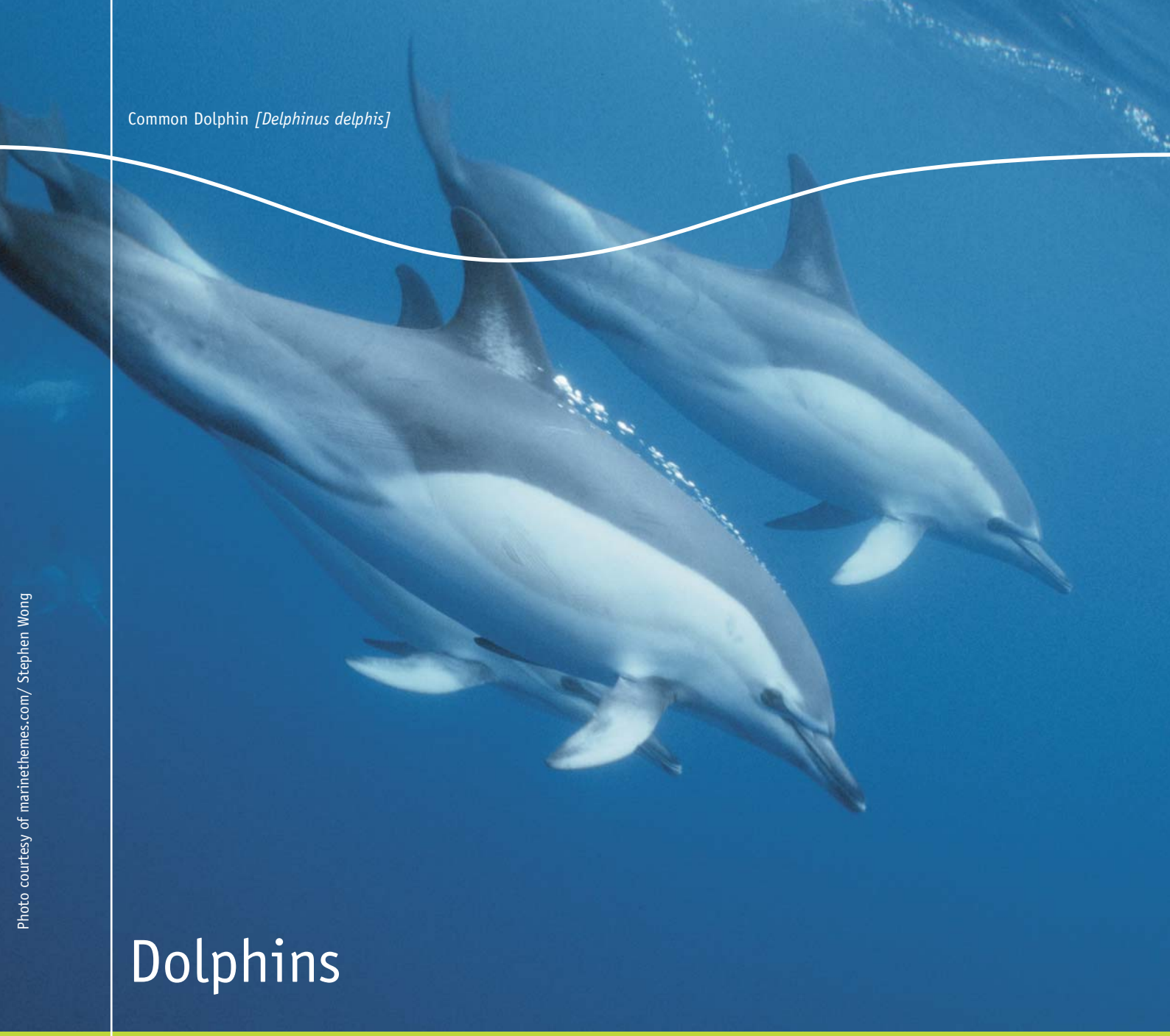
# The heavy metal status of South Australian Dolphins—an overview

Government of South Australia

EPA South Australia

WaterCare It's in your hands

South Australian Museum



Common Dolphin *[Delphinus delphis]*

Photo courtesy of marinethemes.com/ Stephen Wong

# Dolphins

## In the coastal waters of South Australia there are three main types of dolphins:

> **Indo-Pacific bottlenose dolphins** (*Tursiops aduncus*), which can live for up to 45 years and are found mostly close to shore, swimming only relatively short distances in and around the gulfs of South Australia

> **common bottlenose dolphins** (*Tursiops truncatus*), which can live for up to 45 years and are thought to inhabit mostly offshore regions along the open coastline

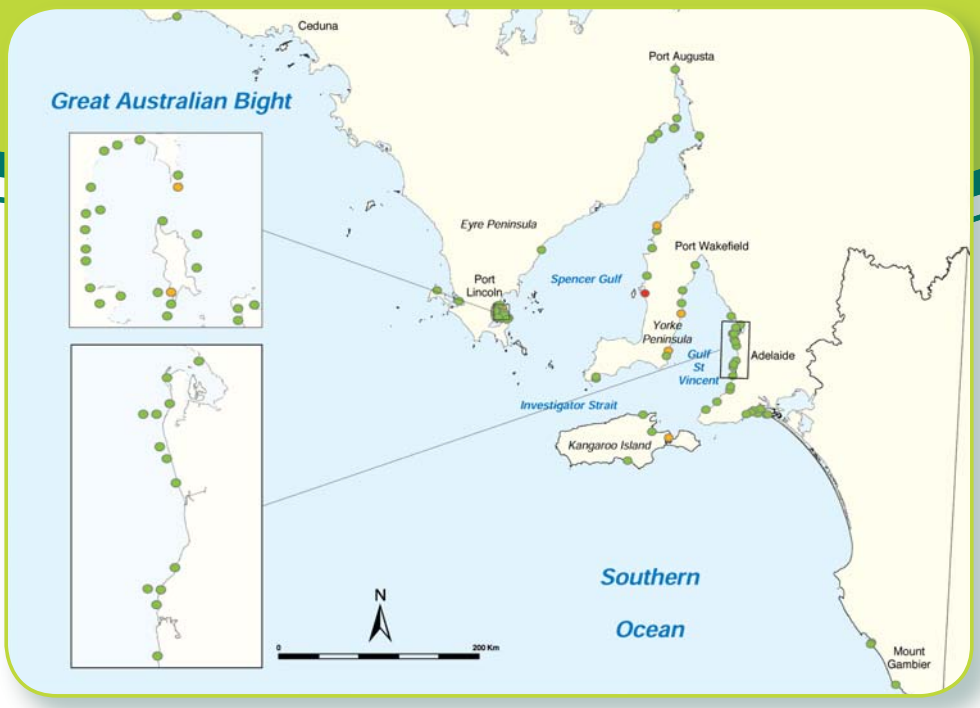
> **short-beaked common dolphins** (*Delphinus delphis)*, which can live up to approximately 25 years and are usually seen offshore in deeper waters, only occasionally coming in close to shore.

## Dolphins are popular residents of South Australian coastal waters and play an important role in the marine environment.

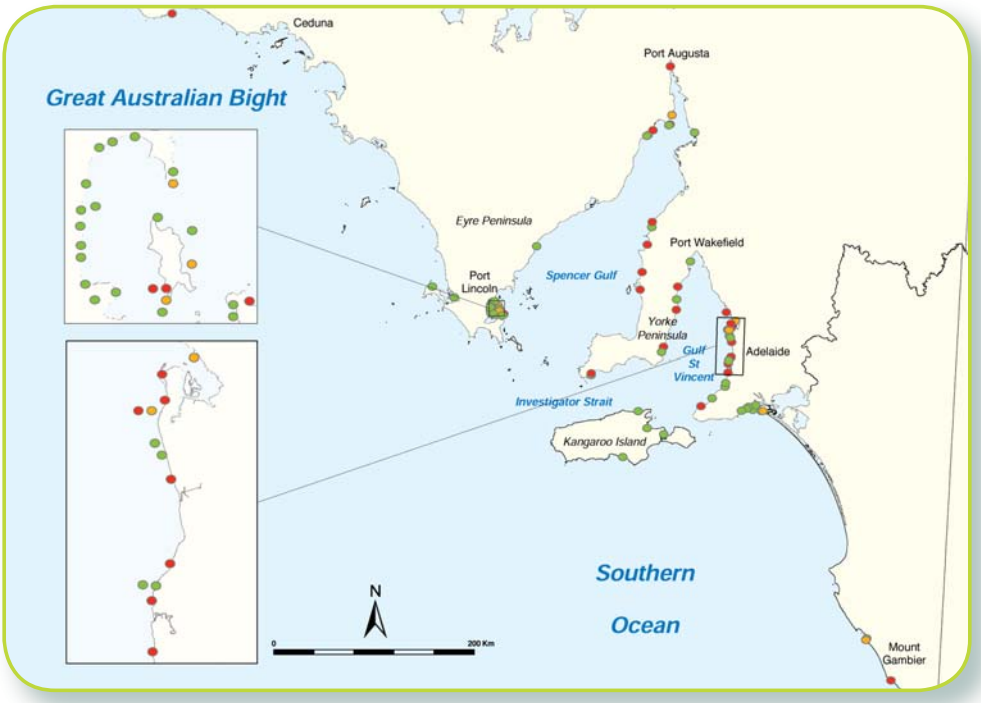
However, human activities and pollution from industries and urban areas have had significant impacts on the marine environment and dolphins over the years, most noticeably around the Port River.

Dolphins are at risk from pollution because they live for a long time and this increases their exposure to pollutants. Because dolphins are also at the top of the food chain, they are at increased risk of exposure to those pollutants which accumulate through the food chain.

Concerns regarding dolphin health and safety have led to the development of the Adelaide Dolphin Sanctuary, which aims to protect the waters around Port Adelaide and Barker Inlet for dolphins and other marine animals.




Above: **Cadmium** in dolphin liver




Above: **Mercury** in dolphin liver

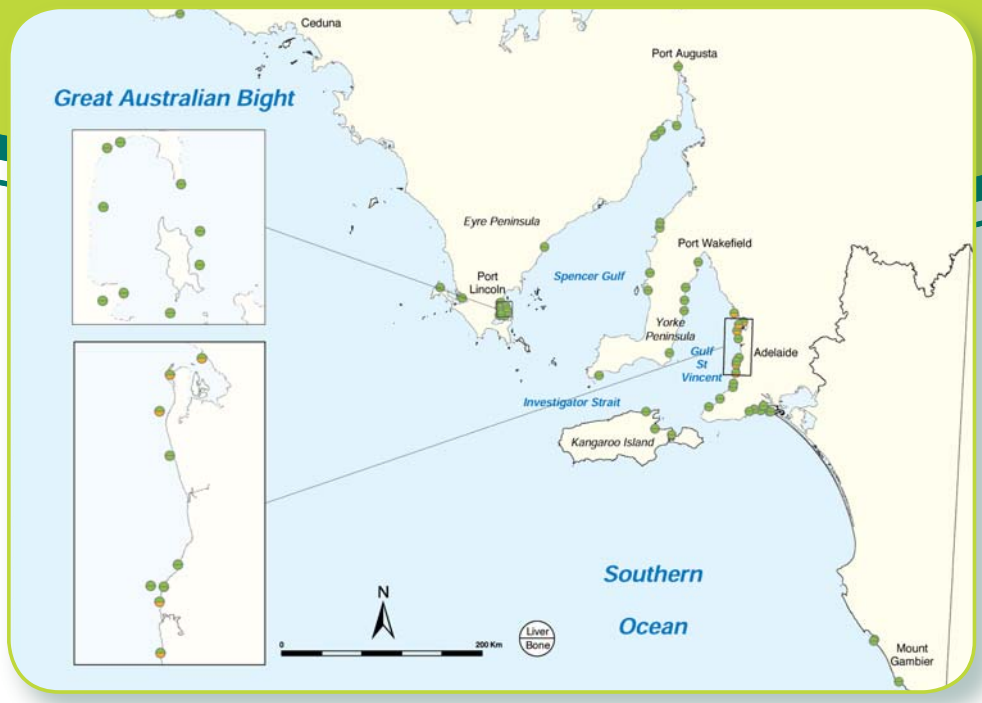
Heavy metals are a particular concern as they do not readily break down and can have a toxic effect on dolphins and the environment.

Some heavy metals, such as cadmium, lead, copper, mercury and zinc, occur naturally in the marine environment when soil and weathered rock fragments are washed into the sea by rain, and from the natural breakdown of geological and volcanic regions under the water.

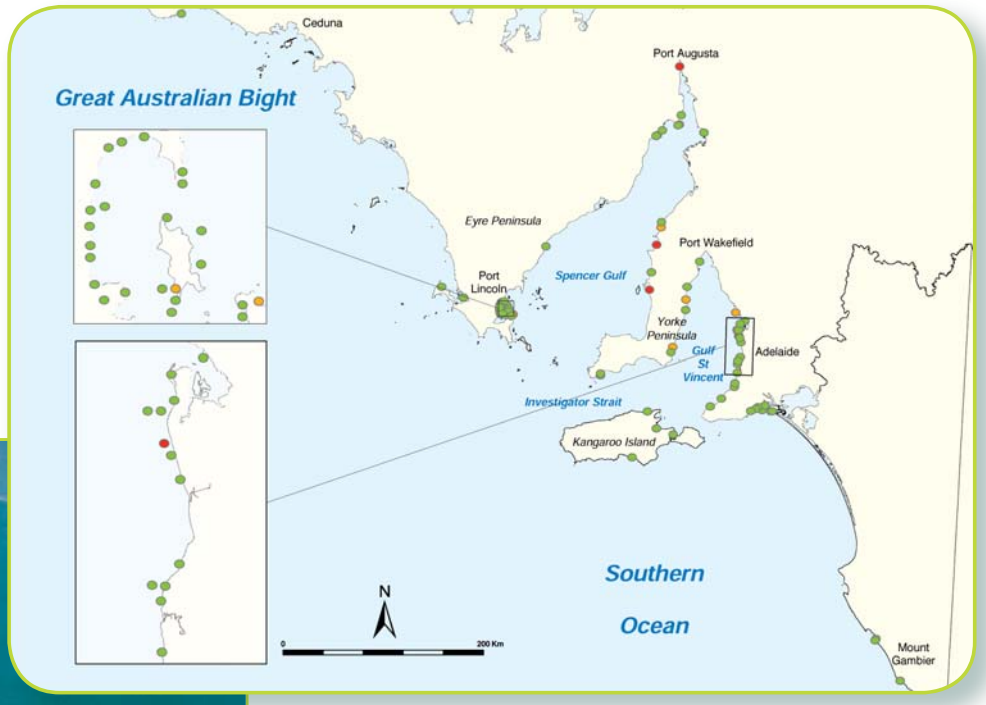
But heavy metals are also released into the marine environment from industries, wastewater treatment plants and stormwater runoff from roads. Currently, little is known about the amount of heavy metals in South Australian dolphins and what impact they may have on them.

The Environment Protection Authority (EPA) has completed a study to investigate and better understand the amount of heavy metals in South Australian dolphins.

This study built on a significant amount of work done previously by The University of Adelaide and the South Australian Museum.




Above: **Lead** in dolphin liver & bone




Above: **Zinc** in dolphin liver

# Legend to maps

- Low
- Moderate
- High
- No Sample

# What we did

## The South Australian Museum has been collecting tissue samples from dead dolphins that have been washed up on beaches since 1988.

These dolphins died from entanglement, natural causes and also intentional killings.

The SA Museum estimates the age of dolphins by looking at the condition of their teeth. In this study, we compared only dolphins with similar tooth condition (and therefore age) with each other.

Also, we made an estimate of where each dolphin mainly lived based on where its body was found. These locations were broadly classified into three regions: Gulf St Vincent, Spencer Gulf and the Southern Ocean.

We tested the tissue samples for a range of heavy metals, including cadmium, lead, mercury and zinc, and also for selenium.

Then we compared results to see if there were any differences in the amount of heavy metals in dolphins from each of the three regions.

We were also interested to see if there were differences in the amount of heavy metals in the three different species, and if these levels in South Australian dolphins were similar to those in other places around the world.

# What we found

## Cadmium, lead, mercury and zinc all occur in the marine environment naturally, but are also discharged by wastewater treatment plants, heavy industries and stormwater runoff to varying degrees.

Cadmium levels in dolphins were generally low; however, there were occasional higher levels in a few Indo-Pacific bottlenose dolphins, possibly due to natural variation within the dolphins. It was unclear whether the cadmium was having any adverse effect on the dolphins.

The generally lower level of cadmium in common dolphins was presumably due to differences in where they lived, their food sources and their life spans.

Lead was measured in both the liver and bones of dolphins. In every case there was more lead in the bone than the liver, which suggests that most of the lead was accumulated some time ago.

Lead levels in liver were classified as low in all regions, and in bone as moderate in Gulf St Vincent but low in all other regions—possibly due to the historical use of leaded petrol. The Indo-Pacific bottlenose dolphins had more lead in both liver and bones than either of the other two species, probably because they live closer to the shore.

The majority of mercury in the environment is likely to be from natural geological sources. Mercury can form a bond with selenium, making it relatively harmless when taken up by dolphins.

Mercury levels were classified as high in Indo-Pacific bottlenose dolphins in all regions and moderate in common bottlenose dolphins in the Southern Ocean. Levels in common dolphins were classified as low throughout the state; this could be due to the shorter life span of the common dolphins compared to the bottlenose dolphins.

All three regions showed high results, which suggests the mercury in the dolphins is from naturally occurring geological sources. Similar high mercury levels have also been recorded in marine organisms of southern Australia in previous reports.

Zinc levels were classified as low for all regions and across all species.

# Conclusions

> *Concentrations of most heavy metals in South Australian dolphins are generally low compared to other locations around the world. However, a few dolphins had high cadmium, lead, selenium or zinc concentrations*

> *Mercury was classified as high in Indo-Pacific bottlenose dolphins from all three regions. However, it is thought that the mercury is not affecting the dolphins because it has formed a bond with selenium, making it relatively harmless. There is evidence that the mercury is probably from natural geological origins*

> *With the exception of lead, there was no difference in heavy metal concentrations among the three regions across South Australia. This suggests that there are natural sources of heavy metals in South Australian coastal waters and no one region is affecting dolphins more than another*

> *Lead concentrations were highest around the Adelaide metropolitan region, possibly because of historical leaded petrol use, which has been slowly phased out since the mid 1980s*

> *Metal concentrations were higher in both species of bottlenose dolphin compared to the common dolphin; this is possibly due to the longer life span of the bottlenose dolphins and differences in habitats and diets between the species.*

**Environment Protection Authority**
GPO Box 2607, Adelaide 5001
**Tel:** (08) 8204 2004
**E-mail:** *epainfo@state.sa.gov.au*
**Internet:** *www.epa.sa.gov.au*