



Blooming surprise

toxic algal blooms in Perth rivers

Algal blooms in the Swan Canning Riverpark have been rapid and concentrated. Scientists have responded quickly to understand more about the algae and its potential toxicity to humans through seafood consumption.

by Dr Kerry Trayler and Dr Jeff Cosgrove





Since early February 2019, the Swan Canning Riverpark has experienced two widespread blooms of toxic dinoflagellate microalgae that seriously impacted fishing activity on the waterway. The microalgae, *Alexandrium* spp., occurred at such high concentration that the Department of Health issued advice against consuming seafood from affected areas over summer/autumn in 2019 and 2020.

The two blooms were unprecedented in scale in Western Australia and required scientists from the Department of Biodiversity, Conservation and Attractions (DBCA) to respond quickly to understand *Alexandrium*, its toxicity and potential control, to inform the management response.

LITTLE ALGAE BIG KICK

The tiny (smaller than 0.03 millimetres) dinoflagellate genus, *Alexandrium*, comprises about 31 species, and roughly half of these produce paralytic shellfish toxins (PSTs), which are harmful to humans.

PSTs can be concentrated by filter feeding shellfish (e.g. mussels, clams and oysters), crustacea (e.g. crabs and lobsters) and even marine snails. Consumption of affected seafood can result in paralytic shellfish poisoning (PSP), with symptoms ranging from a slight tingling sensation or numbness around the lips to fatal respiratory paralysis. Global estimates suggest almost 20 per cent of PSP cases are attributable to *Alexandrium* species.

Alexandrium toxicity is influenced by species, strain, geographic region and

environment conditions, as well as the biological pathway of contamination. In Australia, detection of PSTs in blue mussels arising from *Alexandrium tamarense* seriously impacted the Tasmanian East Coast rock lobster export fishery in 2012.

Toxins were detected in mussels, scallops and lobster, causing a widespread closure of recreational and commercial fisheries in the region. While there have been no recorded deaths in Australia, PSTs are routinely monitored as part of commercial fishery quality assurance programs in many states.

LOCAL BLOOM

Water quality of the Swan Canning Riverpark is monitored weekly and scientists keep a close watch on the density of harmful algae. The detection of *Alexandrium*, even at one cell/mL, is considered serious enough to report to the Department of Health.

Over the past decade, monitoring has only detected *Alexandrium* in less than 0.03 per cent of all samples (maximum 40 cells/mL in 2001) and incidents were short-lived. So, the scale and intensity of the bloom that arrived in February 2019 came as a surprise.

Lasting 15 weeks, a bloom of *Alexandrium minutum* affected areas between Pelican Point and Herne Hill on the Swan River and reached 9890 cells/mL at its peak. A second major bloom began in December 2019, this time impacting both the Swan and Canning rivers, reaching 15,453 cells/mL and taking 18 weeks to fully subside.

Two species of *Alexandrium* were detected during the second event, *A. minutum* and *A. pacificum* and visible,

Main Yellow plumes were observed during the peak of the bloom in 2020. As a general rule, the public should avoid swimming in areas of discoloured water.

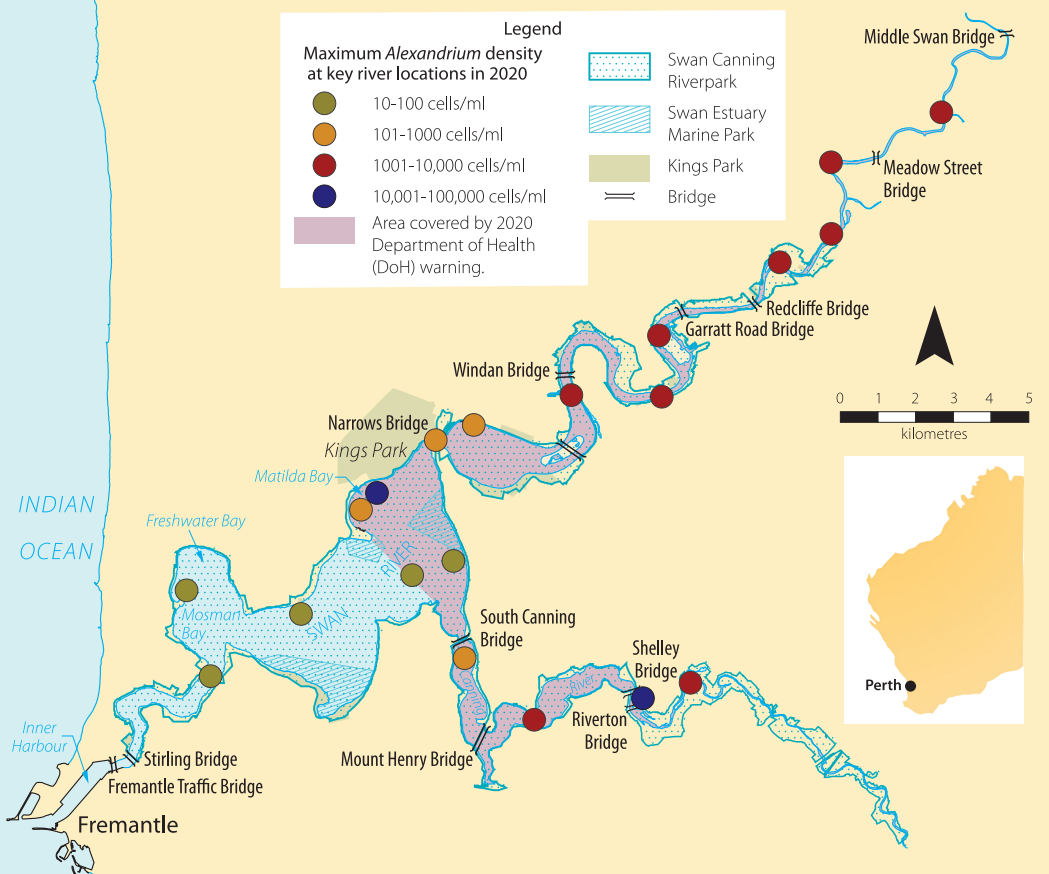
Photo – Steve Schneider

Insets from far left Harmful algae caution signs were posted at key traffic bridges, popular fishing locations and boat ramps throughout the Swan Canning Riverpark. Photo – Lauren Cabrera
DBCA and DPIRD scientists worked together to collect and test crabs for potential toxins caused by the microalgae.

Inset right Water quality sampling is conducted weekly and investigated for the presence of harmful algae.

Photos – DBCA





Above Toxicity assessments were undertaken on mussels, crabs, and fish from the Riverpark.

Below The head, guts and gills of crabs collected from the river should be removed before consumption.
Photos – DBCA

yellow-coloured plumes were observed in parts of the waterway.

TOXICITY CONCERN

During each of these major bloom events, the Department of Health issued warnings advising fishers to avoid consuming seafood from affected areas. This precautionary approach was supported by evidence collected by scientists at DBCA and the Department of Primary Industries and Regional Development (DPIRD), who worked together to collate information on the concentration of toxins in mussels, crabs and fish in bloom affected zones.

Over the course of the two blooms, PSTs were detected in mussels at 11 times the safe levels for human consumption (as identified in the Australian and New Zealand Food Standards Code 2017). Toxins detected in crab viscera (guts) were twice the prescribed guideline levels. Only trace level PSTs were detected in crab flesh and no toxins were detected in fish flesh.

CONTROL OPTIONS

Algal dynamics respond to ambient environmental conditions and the two

Alexandrium blooms are believed to be associated with favourable temperatures, salinities, and available nutrients in the riverpark, as well as the relatively calm conditions that prevailed.

Although catchment initiatives are in place to reduce nutrients entering the waterway, it is predicted that *Alexandrium* will return regularly over future summer and autumn periods. These algae form cysts as a strategy to survive unsuitable conditions and it is anticipated that these may provide a ‘riverbed seed bank’ for subsequent blooms.

Given the likelihood of successive bloom events, DBCA scientists undertook a trial of locally available clays for their potential to remove *Alexandrium* from solution. Bentonite clay had shown some

potential for control of other dinoflagellate algae, but in this case did not prove to be a suitable control option. Other approaches are being considered as part of a multi-agency collaboration with research institutions.

FISHER BEWARE

As the next algal bloom season is upon us, scientists are keeping a cautious watch on algal densities. Fishers are advised not to eat wild-caught shellfish from the Swan and Canning rivers and, as a general rule, recreational crabbers should remove the head, guts (mustard) and gills from crabs before freezing, cooking or eating in order to reduce their risk of ingesting PSTs. Harmful algae caution signs have been posted at key locations.



Dr Kerry Trayler is a Rivers and Estuaries Science program leader with DBCA's Biodiversity and Conservation Science and can be contacted at kerry.trayler@dbca.wa.gov.au
Dr Jeff Cosgrove is an environmental officer with DBCA's Biodiversity and Conservation Science and can be contacted at jeff.cosgrove@dbca.wa.gov.au